Nova Scotia

ANNUAL REPORT

for the fiscal year
ending March 31, 1989

Department of Mines and Energy

91-06921/

PROVINCE OF NOVA SCOTIA
DEPARTMENT OF MINES AND ENERGY

The Honourable Lloyd Crouse, P. C.
Lieutenant-Governor of Nova Scotia

Sir:

I have the honour to submit herewith the Annual Report of the Department of Mines and Energy of the Province of Nova Scotia for the period April 1, 1988, to March 31, 1989.

Respectfully submitted,

Jack MacIsaac
Minister of Mines and Energy

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John J. Laffin

John J. Laffin, P.Eng., F.E.I.C.
Deputy Minister

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DEPUTY MINISTER'S REPORT

John J. Laffin, P.Eng., FEIC

The Department of Mines and Energy has a broad mandate to encourage research and development leading to increased energy and mineral resources and to promote their orderly development, regulation and use. To accomplish this mandate, the Department manages a wide variety of projects and programs from energy conservation to mineral deposit investigations. The Department provides many services to the people of Nova Scotia, industry and government agencies.

Much of this work is assisted and supported by co-operative federal-provincial agreements. At present three agreements are in place that provide assistance to develop alternative energy resources and to strengthen and promote the mineral industry in Nova Scotia.

The Canada–Nova Scotia Oil Substitution and Conservation Agreement was initiated to decrease Nova Scotia's dependency on imported oil through conservation and increased use of alternative energy sources, including coal. The agreement was scheduled to terminate in March 1987 but was extended to March 1989 for completion of approved projects. The Memorandum of Understanding on Conservation and Alternate Energy offers additional funding for alternative energy and conservation programs.

In the Mines and Minerals Branch, the Canada–Nova Scotia Mineral Development Agreement (CNSMDA) continues in force until March 1989, with one additional year, 1989-90, for a "clean-up" year. This five year agreement, signed in June 1984, is valued at $26.9 million. Through its five programs — geoscience, mineral development, mineral research and technology, mineral investment stimulation and public information — the agreement is designed to strengthen and promote the mineral industry in Nova Scotia.

Co-operative work on mineral resource investigations by the Geological Survey of Canada and the Department, through the CNSMDA, has stimulated the private sector's search for minerals in Nova Scotia and has assisted in a major expansion of mineral exploration and development. Approximately $35 million were spent for exploration and development, principally for gold, by the mineral industry during the 1988 calender year.

Optimism for the future of the mineral resources sector continues. Major exploration and underground development programs continue for gold, coal, industrial minerals, and aggregates. During 1988, the value of mineral production was $505 million. The staff of the Department worked with many production companies to provide assistance in assessing mineral deposits, increasing mineral recovery and decreasing energy use. Nova Scotia's mineral production and the direct, indirect and induced economic benefits from the mineral industry contributed substantially to the provincial economy. In 1988, mining and related activities contributed approximately 1.8% of the gross provincial product.

Geology and mining engineering students in Nova Scotia universities, colleges and schools received practical training through summer employment with the Department. The expanded field and office work created by the many CNSMDA projects gave employment to more than 40 students.

The Department continued to monitor petroleum and natural gas exploration work onshore and offshore, issues related to offshore resources, natural gas marketing and pricing policies, and Canadian and American States regulatory issues.

At the end of the fiscal year, 276 023 ha were under active exploration license. Mobil drilled the South Sable B-44 well and discovered additional natural gas reserves. The well tested at 606 000 cubic metres per day.

Nova Scotia Resources Limited, a provincial crown corporation, and a Nova Scotia based private company, Iona Resources, announced their interest in developing the Panuke and Cohasset oil fields.

A number of programs have been developed by the Department, some with assistance from federal-provincial energy conservation agreements, to conserve energy in keeping with the Government of Nova Scotia's long-term commitment to energy self-sufficiency. During the year 112 small businesses and government offices received energy audits to assist them in developing energy alternatives and conservation. The progress of energy conservation is represented by the decrease in use of refined petroleum products from 5.3 million cubic metres in 1978 to less than 3.86 million cubic metres in 1988. During the fiscal year, petroleum accounted for 65.8 per cent of primary energy consumption.

The Department funded research for the use of coal-water fuel (carbogel), coal gasification and coal liquefaction as alternative uses of coal. The work of the Department strengthens the knowledge of coal resources and potential uses for coal in the province. The Deputy Minister continues as Chairman of the Committee on Atlantic Coal, a group that promotes research and development for coal mining and utilization in the region.

Working with the highly motivated and professional staff of the Department is a pleasure. Their work, achievements and publications are described in the following pages. I wish to thank the Minister of Mines and Energy, the Honourable Jack MacIsaac, for his advice and assistance.

Nova Scotia is well endowed with mineral and energy resources. The steady production growth of industrial minerals, coal, aggregates and tin, along with major gold development projects, has encouraged the exploration and mining sectors and greatly aided the provincial economy. Nova Scotia is a good location for the development of energy– and mineral–related projects because of its varied geology, strong workforce, geographical location and deep-water ports, and history of mineral and energy development.

ORGANIZATION AND PERSONNEL OF THE DEPARTMENT

ORGANIZATION

The Department of Mines and Energy is organized into seven divisions. Three of these divisions, Mineral Resources, Mineral Development and Mining Engineering are grouped together in the Mines and Minerals Branch under an Assistant Deputy Minister (ADM). The Energy Resources, Energy Management and Economics and Statistics Divisions form the Energy Branch, also under the direction of an Assistant Deputy Minister. The two ADMs and the Director of the Administration Division report to the Deputy Minister. The organization of the Department at 31 March 1989 is shown in Figure 1.

RESPONSIBILITIES

Mineral Resources Division: responsible for the assessment of the province's mineral potential:

- Investigates the geology and documents mineral occurrences of the province through its own scientific programs and through analyses of private sector exploration activities, and

- Provides nontechnical information, through maps, brochures, pamphlets and talks, about the geology and mineral resources, exploration and mining in Nova Scotia.

Mining Engineering Division: responsible for ensuring that Nova Scotia mines are developed according to current safety, environmental and mining practices and regulations:

- Conducts engineering studies. Approves mining plans, and

- Administers departmental diamond-drilling operations.

Mineral Development Division: responsible for issues involving the exploration and utilization of the province's mineral resources:

- Maintains a mineral and petroleum rights registry,

- Assists development of mineral resources,
- Operates technical publications libraries in Halifax and Stellarton,
- Maintains a core library and repository in Stellarton, and
- Monitors all private sector exploration work.

Energy Resources Division: responsible for the development of the Province's indigenous energy resources: peat, coal, petroleum and natural gas:

- Monitors and regulates all petroleum exploration and development,
- Undertakes coal and peat exploration programs, and
- Promotes energy resource development.

Energy Management Division: responsible for issues involving the supply of energy from outside the province and the demand for and utilization of energy within the province:

- Develops economic analyses and statistics on energy matters,
- Provides engineering services related to energy use,
- Develops and administers energy conservation programs, and
- Provides public information about energy.

Economics and Statistics Division: responsible for co-ordination and planning of provincial energy activities and policy advice:

- Provides economic and statistical analyses relating to energy matters, and
- Provides policy advice on energy matters.

Administration Division: responsible for providing financial and other support services to the divisions of the Department:

- Provides accounting, mineral taxation, legal and personnel services,

- Administers coal mine/miner financial aid programs,
- Provides cartographic and photographic services, and
- Provides accounting services for Novaco Ltd.

PERSONNEL AND OFFICES

The Department has 162 employees, most of whom are employed in Halifax and Stellarton.

Halifax

Founders Square, 1701 Hollis Street

Mines and Minerals Branch	424-5346
Mining Engineering Division	424-5764
Mineral Development Division	424-4162
Energy Branch	424-5351
Energy Resources Division	424-5933
Energy Management Division	424-5019
Economics and Statistics Division	424-8161
Administration Division	424-4629

Brewery Complex, 1496 Lower Water Street

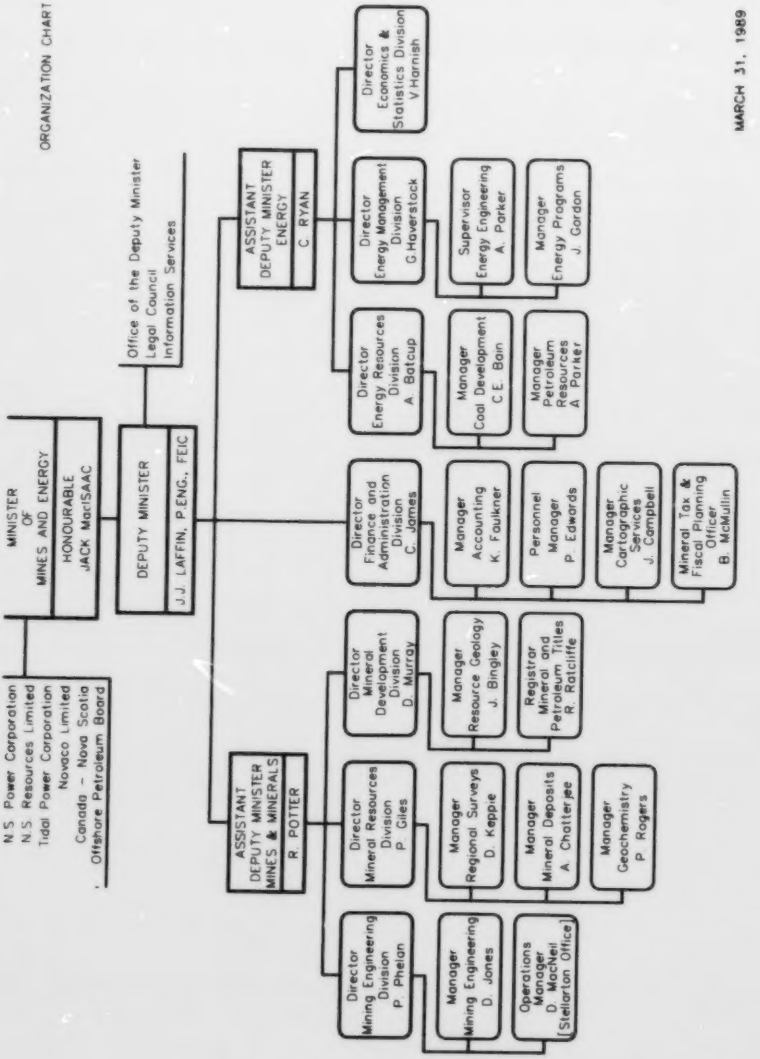
Mineral Resources Division	424-4700

Stellarton

32 Bridge Avenue	752-8430

Mineral Development Division
Engineering Division
Energy Resources Division

Fig. 1


ORGANIZATION CHART
MINISTER OF MINES AND ENERGY
HONOURABLE JACK MacISAAC
N.S. Power Corporation
N.S. Resources Limited
Tidal Power Corporation
Novaco Limited
Canada – Nova Scotia Offshore Petroleum Board
DEPUTY MINISTER
J.J. LAFFIN, P.ENG., FEIC
Office of the Deputy Minister
Legal Council
Information Services
ASSISTANT DEPUTY MINISTER ENERGY
C. RYAN
ASSISTANT DEPUTY MINISTER MINES & MINERALS
R. POTTER
Director Economics & Statistics Division V.Harnish
Director Energy Management Division G.Haverstock
Supervisor Energy Engineering A. Parker
Manager Energy Programs J. Gordon
Director Energy Resources Division A. Batcup
Manager Coal Development C.E. Bain
Manager Petroleum Resources A. Parker
Director Finance and Administration Division C. James
Manager Accounting K. Faulkner
Personnel Manager P. Edwards
Manager Cartographic Services J. Campbell
Mineral Tax & Fiscal Planning Officer B. McMullin
Director Mineral Development Division D. Murray
Manager Resource Geology J. Bingley
Registrar Mineral and Petroleum Titles R. Ratcliffe
Director Mineral Resources Division P. Giles
Manager Regional Surveys D. Keppie
Manager Mineral Deposits A. Chatterjee
Manager Geochemistry P. Rogers
Director Mining Engineering Division P. Phelan
Manager Mining Engineering D. Jones
Operations Manager D. MacNeil [Stellarton Office]
MARCH 31, 1989

MINES AND MINERALS BRANCH

R. R. Potter, Ph.D.
Assistant Deputy Minister

The mineral resources of Nova Scotia and the mines that produce them are an important part of the provincial economy. These mining activities provide direct employment for more than 5700 people. The development and well-being of the province's mineral resources sector is an essential part of the work of the Mines and Minerals Branch of the Department.

The Branch has a mandate to promote the understanding of the mineral resources and geology of the province; the exploration, development and efficient production of mineral deposits; and the maintenance of safe and environmentally acceptable mining practices.

Three divisions report to the Assistant Deputy Minister for Mines and Minerals. The Mineral Resources Division explores, assesses and publicizes the province's mineral resources. The Mining Engineering Division ensures that mines in Nova Scotia are developed according to current safety, environmental and mining practices. The Mineral Development Division promotes the exploration and utilization of the province's mineral resources.

MINERAL RESOURCES DIVISION

Peter S. Giles, PhD, Director

INTRODUCTION

The Mineral Resources Division provides the Department of Mines and Energy, other government agencies, members of the mineral exploration community and the public with timely and objective descriptions and assessments of the geology and mineral resources of the province.

The orderly development of Nova Scotia's mineral resources requires a thorough knowledge of the geology of the province. This information is useful to many other users and is often essential to the understanding of environmental hazards and land use planning.

The Division's activities have been expanded through the programs of the Canada–Nova Scotia Mineral Development Agreement (CNSMDA). This five–year agreement began in 1984 and will provide $26.9 million to stimulate and strengthen the mineral industry in Nova Scotia. The location of division activities is shown on Figure 2.

Thirty geologists are employed in activities of mineral resource investigations, editing and publishing, and education and public awareness. The activities of the Division are:

- determining the mineral potential of known deposits,
- searching for indications of new deposits through regional geochemical sampling and geological mapping, and
- publicizing the results of investigations by oral presentations at scientific meetings, publications in scientific journals, NSDME publications and popular brochures and booklets.

ACTIVITIES

Geological investigations in progress include regional bedrock mapping, mineral deposit studies, geochemical surveys, a study of Quaternary glacial deposits and their geochemistry, and regional assessment of the role of plate tectonics in mineral deposit genesis. In

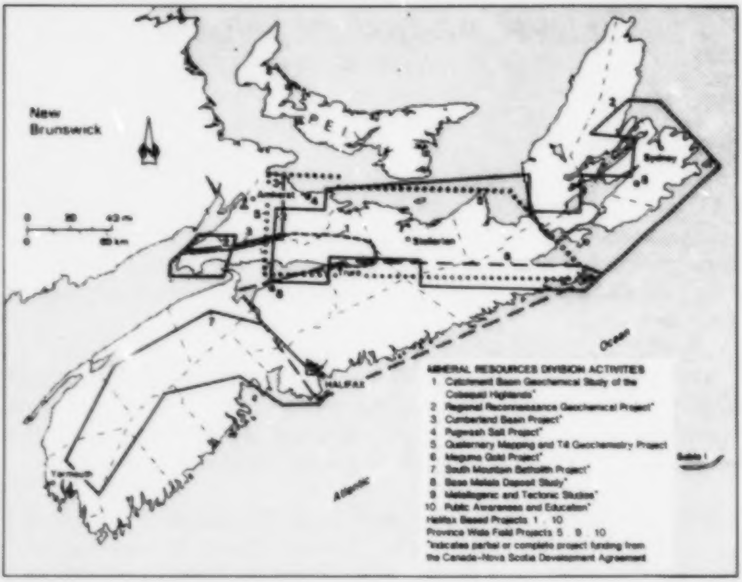

New Brunswick
P.E.I.
Halifax
Yarmouth
Atlantic
Ocean
Sydney
Sable I.
MINERAL RESOURCES DIVISION ACTIVITIES
1 Catchment Basin Geochemical Study of the Cobequid Highlands*
2 Regional Reconnaissance Geochemical Project*
3 Cumberland Basin Project*
4 Pugwash Salt Project*
5 Quaternary Mapping and Till Geochemistry Project
6 Meguma Gold Project*
7 South Mountain Batholith Project*
8 Base Metals Deposit Study*
9 Metallogenic and Tectonic Studies*
10 Public Awareness and Education*
Halifax Based Projects 1 . 10
Province Wide Field Projects 5 . 9 . 10
*indicates partial or complete project funding from the Canada-Nova Scotia Development Agreement

FIGURE 2. Locations of Mineral Resources Division projects.

addition, the Division has undertaken a program entitled the Education and Public Awareness Program, to bring to the public an appreciation of the province's mineral industry and its importance to Nova Scotia's continued economic development. All activities are completely or partially funded by the CNSMDA.

The Division continues to emphasize the importance of mining and mineral exploration to the province through a variety of educational programs designed for the general public. In addition, considerable emphasis is placed on the timely preparation of technical reports and maps, which enable new data generated to be applied for a variety of purposes relevant to resource development. Members of the Division prepare and deliver technical papers at various professional meetings and general interest presentations at local schools, service clubs and other organizations.

Staff of the Division were actively involved in the management of programs funded by the CNSMDA during the fiscal year. The director is a member of the Management Committee and co-chairperson of the Geoscience Subcommittee. The Regional Surveys manager is the CNSMDA co-ordinator. The head of the Education and Public Awareness Program is co-chairperson of the Public Information Subcommittee. He also sits as the Department's representative on the Soil and Water Conservation Issues Group of the Deputy Minister's Land Use Policy Committee.

The Manager of the Geochemistry and Quaternary Geology Section was General Organizing Chairman of the Prospecting in Areas of Glaçiated Terrain (PAGT) Conference held during the period 28 August to 3 September 1989. Many members of the Division and other staff from the Department assisted to make this conference a success.

Regional Surveys Section

J. D. Keppie, PhD, Manager

INTRODUCTION

The Regional Surveys Section provides detailed and reconnaissance geological and geophysical mapping of the province. The Section's purpose is to develop an understanding of the geological history of Nova Scotia and how it has influenced the formation of mineral deposits. The Section provides support for the Mines and Minerals Branch Education and Public Awareness Program. Funding from the Geoscience and Public Information programs of the CNSMDA supports most of the activities in the Section.

PROJECTS

Three projects are underway at present. Two are designed to provide a better geological understanding of the mineral resources in parts of Cumberland, Colchester and Pictou Counties. The third is a compilation of mineral resources and geological data to broaden the understanding of plate tectonic processes in mineral deposit genesis.

Cumberland Basin Study

The Cumberland Basin is a large area of sedimentary rocks stretching from the Springhill area through Oxford to Tatamagouche in Cumberland, Colchester and Pictou Counties. The purpose of this study is to provide an understanding of the rock succession, the ancient environments and mineral resources. The region is known to have reserves of salt and coal, and occurrences of copper, lead, zinc, uranium, vanadium, gold and silver. The province's two salt mines are located in this basin. The salt in these deposits and others has potential for discoveries of potash.

The Canadian Salt Company mine at Pugwash is the subject of a detailed study of salt deposits and related mineral occurrences. A geologist has completed mapping of the underground salt deposit and is now working on the final report and maps.

All of the geological field mapping has been completed for the project and the information is now available on 93, 1:10 000 scale maps on open file through the Department's library. Members of the project have spent time preparing a final report of the for the project. In November 1988, a special symposium at the annual Open House and Review of Activities described the geology and mineral resources of the Cumberland Basin.

Stratigraphic Drilling in the Shubenacadie Basin

This project was an outgrowth of previous work in the Stewiacke and Shubenacadie areas to describe the geology and mineral resources of the region. The region is underlain by a large thickness of limestone, salt, anhydrite and gypsum, and shale. The purpose of drilling was to test the succession of rock units and to determine how thick the salt, anhydrite and gypsum were.

Drilling operations were started on 5 October 1987 and were completed on 20 May 1988. The hole was cored continuously from 91.4 m to 683 m. It was cemented to the surface and abandoned. The core is stored for future study and reference at the Department's Core Storage Library in Stellarton.

The hole was terminated at 683 m in petroliferous anhydrite because of the uncontrolled flow of natural gas into the hole. The average flow over six days was 105 m^3/day at an estimated pressure of 11 381 kPa.

Metallogenic Map Project

This project is designed to stimulate exploration for known and suspected occurrences of minerals in the province through an interpretation of plate tectonic processes. The end product will be a map and memoir showing the important structural features of Nova Scotia (folds and folds) and associated mineral occurrences (metallogenic map). This work is important in assessing and predicting the province's mineral occurrences and mineral potential.

During the summer of 1988, field work in Antigonish County helped to unravel the sequence of events responsible for many small base metal showings. Detailed mapping followed by laboratory work is necessary to develop an understanding of the structural and mineralizing events. Later, these studies of small areas are amalgamated into a broad understanding of various regions in the Province for preparation of the metallogenic map.

EDUCATION AND PUBLIC AWARENESS PROGRAM

The purpose of the Education and Public Awareness Program is to produce and promote educational information about the geology, mineral resources and mining history of the province and about the geological projects of the Mines and Minerals Branch. The prospecting course, displays, walking tours, the annual Open House and publications are ways of meeting this goal.

During the fifth year of the CNSMDA, the staff of the Education and Public Awareness Program continued projects to further the goals of the Public Information Program. Displays feature information about the Agreement and describe in detail some of the projects. Special publications were prepared and published to describe some of the programs of the Agreement and their benefits to the mineral industry.

Prospecting Course

A prospecting course was not offered during the 1988-89 fiscal year. The Education and Public Awareness Group worked with the Chamber of Mineral Resources of Nova Scotia in the planning and preparation of a revised prospecting course and the development of an advanced prospecting course.

Displays

The Education and Public Awareness Program is responsible for displays describing the mineral resources and mining in the province, and the projects of the Mines and Minerals Branch. Displays at technical meetings and various exhibitions across Nova Scotia during the fiscal year presented information about previous gold mining, mineral exploration and development, the province's mineral resources and the programs of the CNSMDA.

During the summer of 1988 displays were prepared and shown in 11 locations in different parts of the province. In addition, major displays were prepared for the Nova Scotia Forestry Exhibition (Windsor), Cape Breton Resources Exhibition (Baddeck), Halifax County Exhibition (Middle Musquodoboit), Rockhound Roundup (Parrsboro), Prospecting in Areas of Glaciated Terrain (PAGT) Conference (Halifax), Atlantic Winter Fair (Halifax) and the Prospectors and Developers Association of Canada (Toronto). More than 36,000 people have seen the displays here in the province and elsewhere.

Two displays were established at the annual meeting of the Prospectors and Developers Association of Canada (PDAC). One display introduced the Department, and the mineral exploration and potential of the province. The second display focused on industrial minerals and recent advances in the geological understanding of the southern part of Nova Scotia. New work of the South Mountain Batholith and Meguma Gold Projects were shown to delegates at the PDAC.

Open House

Each year the Mines and Minerals Branch hosts the Open House and Review of Activities. The event was held on 16 and 17 November 1988 at the Lord Nelson Hotel, Halifax. More than 350 people attended the function to hear talks and see displays by geologists from the Department, the Geological Survey of Canada and Nova Scotia universities. The talks and displays emphasized the work and contributions from the Canada—Nova Scotia Mineral Development Agreement.

This Open House hosted two special symposia. The first, on Wednesday 16 November 1988, was entitled Developing Mines in Nova Scotia and organized by the Chamber of Mineral Resources of Nova Scotia. The second special symposium was prepared by the Department on Wednesday afternoon and focused on Northern Nova Scotia with the title Mineral Resources, Geology and Exploration Techniques in the Cumberland Basin Region.

Walking Tours and Other Educational Projects

Walking tours of (1) downtown areas, (2) parks and (3) tourist areas are becoming very popular. Fifteen walking tours were lead during the fiscal year; those in the summer were delivered in co-operation with the Nova Scotia Museum. More than 350 people have enjoyed learning about the mineral resources and mining, land form development and geology of different parts of Nova Scotia.

The Education and Public Awareness Group is working with the Nova Scotia Museum in the preparation of a loan kit for schools — The Mining Kit. It is designed for grade eight science and emphasizes mineral resources and mining in the province. The kit will be ready for use during the 1989–90 school year.

EDITING AND PUBLISHING SERVICES

Detailed technical publications are the principal means of communicating information about the geology and mineral resources of Nova Scotia. The technical reports are published either as part of the Department's publication series or in scientific journals. The Education and Public Awareness Program produces brochures and pamphlets for the general public. All of these publishing activities are supported by a senior editor, an editor and two word processing operators.

Brief descriptions of each project appear in the annual Open House and Review of Activities publication *Mines and Minerals Branch, Report of Activities, Part A*. Technical summaries for each of the projects appear in the annual *Mines and Minerals Branch, Report of Activities, Part B*. A list of publications by the geologists of the Division, as well as other Departmental publications, appears in Appendix A.

Mineral Deposits Section

A. K. Chatterjee, PhD, Manager

INTRODUCTION

The Mineral Deposits Section has the responsibility of providing information about the mineral deposits and mineral resource potential of the province. It accomplishes this mandate by detailed mapping of mineral deposits and mines, mapping of large areas with high mineral potential, and laboratory research into the genesis of selected mineral deposits. Information of this type is valuable for exploration companies, other government agencies and land use planning.

PROJECTS

Four major projects were undertaken during the 1988-89 fiscal year with funding from the CNSMDA Geoscience Program.

South Mountain Batholith Project

The project goal is to explore and map the large body of granite stretching from Halifax to Yarmouth. This granite body is the largest batholith in the Appalachian Mountains and has the potential for hosting several East Kemptville-type deposits (tin-zinc-copper-silver) and other deposits (tungsten, gold, molybdenum, manganese, beryllium and rare earths).

Field Mapping. The summer of 1988 was the fourth field season for this project. Work was divided between two teams of geologists mapping the bedrock and the surfacical deposits in the western end of the granite. The Sub-division of the batholith into eight mappable units was continued into this new area.

By studying and mapping the granite bedrock geologists are able to assess the mineral potential of the granite. Regional and detailed mapping, laboratory work and chemical analyses of rocks define how the granite and its mineral deposits formed. This in turn leads to better ways of searching for mineral deposits in this granite and other granites within the province.

Study of the glacial deposits covering the batholith forms the second part of the project. The purpose of this part is to study the surficial deposits and glacial geology, assess the mineral potential of the covered granite bedrock through chemical analysis of the glacial till, and attempt to fit the glacial history into the regional geological history.

Results of work from both parts of the project are published in the *Mines and Minerals Branch, Report of Activities, Parts A and B* (see Appendix A). Colour maps with marginal notes are now available for the eastern end of the South Mountain Batholith. Preliminary maps of the areas to the west are available as Open File Maps. New maps covering the remainder of the batholith are now available as Open File Maps.

Mineral Deposit Studies. In parallel with the bedrock and surficial deposits mapping of the South Mountain Batholith, the investigation of mineral deposits located in the granite or near the contact with the granite has provided valuable information about new mineral potential. During 1988 field work was concentrated in a northeast-trending zone of crushed and broken rock (shear zone) along the northwest side of the batholith between Carlton and the East Kemptville tin mine. Three areas of tin mineralization were investigated.

Liscomb Complex Project

As part of the geological work funded by the CNSMDA, all granite bodies in southern Nova Scotia will be investigated by the Geological Survey of Canada and the Department. One of these bodies is the Liscomb Complex located on the northwestern edge of the Liscomb Game Sanctuary, Halifax County.

Several field seasons of mapping and laboratory research have shown that the majority of rock is not granite in this area. Seven small, distinct granite intrusions were defined but of greater interest have been the dark igneous rocks (gabbro), breccia pipes and metamorphic rocks (gneiss). Fragments found in the pipes and dykes are probably from the base of the crust and represent the first insight to the nature of rocks below the gold-bearing Meguma Group. The study of this rock suite will allow geologists to understand more clearly the way in which granites and related mineral deposits are formed.

Meguma Gold Project

The gold-bearing rocks of the Meguma Group are found across southern Nova Scotia from Canso to Yarmouth. Historically, this part of Nova Scotia supported mining in 64 gold districts from 1861 to 1940 with a total production of over 85 million g. Geologists working on this project are re-examining some of these former gold-producing areas to stimulate exploration for gold.

Field and laboratory work for the Meguma Gold Project is being directed toward comparing and contrasting the styles of gold mineralization at 30 gold districts on the Eastern Shore region of Nova Scotia. The purpose of the investigation is to find a unifying cause for gold mineralization.

Results of the study show that most of the rocks near or at the gold deposits were affected by large alteration zones from fluids that originated with granite intrusions. Another common feature is the intricate and composite nature of the quartz veins. Alteration zones are a guide for exploration companies and can give clues to areas potentially rich in gold.

In another part of the project work, geologists mapped and collected samples at the underground gold development projects of several companies. Underground work by Westminer Canada Ltd., Seabright Operations, (Beaver Dam, Halifax County; Forest Hill and Caribou, Guysborough County), Exploration Orex Ltd. (Upper Seal Harbour Lake, Guysborough County), Hecla Mining Corporation of Canada Inc. (Mooseland, Halifax County), and Coxheath Gold Holdings Ltd. (Tangier, Halifax County) provided three-dimensional exposures of gold veins with the attendant alteration zones and quartz veins.

Beaver Dam Deposit. Underground exposures at the Beaver Dam Project of Westminer Canada Ltd., Seabright Operations, provided samples that lead to the discovery of three previously unrecognized minerals from Meguma Gold deposits. The three new mineral phases are a bismuth-tellurium-sulphide complex, a silver-tellurium alloy and a cadmium sulphide. They are not restricted to a particular part of the underground workings nor are they confined to a particular quartz vein type.

The discovery broadens the complexity of the alteration accompanying gold mineralization. It gives geologists an understanding of the mineralogy and chemistry of this deposit that may be useful in the investigation of other gold deposits in the Meguma Group.

Metamorphic History of the Meguma Group. Allied with the examination of gold deposits is the study of the effects of heat and pressure (metamorphism) produced by granite intrusions on the surrounding rock units as well as the overall changes brought to the rocks by heat and pressure. The purpose of this work is to determine the role of metamorphism in forming gold deposits.

Work on this project has assisted exploration and mining companies to understand gold mineralization in Nova Scotia. Detailed results are presented in the *Mines and Minerals Branch, Report of Activities, Parts A and B.*

Mineral Deposits Project

Nova Scotia has a variety of mineral deposits in complex geological environments. Some of these mineral deposits and potential areas for them are being studied in the South Mountain Batholith Project and Cumberland Basin Project. Other mineral deposits are also being investigated through this project.

East Kemptville Deposit. The East Kemptville tin deposit is the site of the only primary tin mine in North America. The tin is present in an altered granite in concentrations of less than one quarter of one per cent. The purpose of this on-going study is to understand how the granite was altered, the time of alteration and mineralization, and the physical parameters such as temperature and pressure for alteration and mineralization.

Initial work indicates that a specialized topaz granite, generated in a zone of movement, hosts a greisen-style tin and base metal mineralization. The mineralization was derived from magmatic fluids at maximum temperatures of approximately 300° C.

Base Metal Deposits Study. The focus of this project is base metals (copper, lead, zinc and related gold and silver) in many different areas of the province. The purpose of the project is to understand how certain deposits formed (for example, the Walton deposit, Hants County, and the Stirling deposit, Richmond County) and how others, not yet discovered, may be defined. The study is a co-operative project involving geologists from the Geological Survey of Canada and Dalhousie University, as well as from the Department.

Geochemistry and Quaternary Geology Section

P. J. Rogers, PhD, Manager

INTRODUCTION

The Geochemistry and Quaternary Geology Section collects and interprets data from the study of glacial deposits and the distribution of elements in soils, streams and rocks. The section's mandate is to provide expertise in the study of glacial deposits and geochemistry and to assist the Division in the development of computer-based data collection, retrieval, and interpretive software and hardware.

PROJECTS

Three important projects are underway. One of these deals with the collection and interpretation of chemical data. Another project involves the mapping of glacial deposits. The third is the development of computer-based data and word processing capabilities. All of this work is directly applicable to the mineral exploration industry and much of the data are needed by these same companies, land use planners and other government agencies.

Regional Geochemistry Project

Work on this project is leading to specific products and procedures that will assist exploration companies in selecting targets for mineral exploration. During this fiscal year work continued on three studies.

The Geochemical Atlas. The goal of this project is to produce an atlas of maps on different scales that shows the distribution of selected elements in lake bottom sediments, well waters, lake waters, stream sediments, soils and rocks across the province. Such an atlas provides a great incentive for exploration companies to continue looking for mineral deposits in Nova Scotia.

All sources of detailed and regional geochemical studies have been located from departmental file and private sector assessment reports. A geochemical software package, Datamine/GX, was purchased to produce a standard in-house geochemical database.

Regional Geochemical Reconnaissance. Regional studies, such as this, allow mineral exploration people to concentrate their resources and effort more efficiently. Instead of broadly looking for minerals, they can use the regional geochemical data to focus their exploration work.

Stream sediments collected during the summers of 1986 and 1987 have generated over 152,000 analytical results. Work continued in developing the database and interpreting the results of various geochemical trends and anomalies.

Exploration Target Selection. A joint project between the Geological Survey of Canada and the departments began several years ago to study the distribution of geochemical elements from streams in catchment basins to the Cobequid Highlands, Cumberland, Colchester and Pictou Counties. This area serves as a case example of how catchment basin analysis can be used to refine the background value of elements for anomaly definition and to aid in the interpretation of regional geochemical survey data.

Using the catchment basin analysis technique, interesting anomalies of gold and base metals (Cu, Pb, Zn) have been identified in the Carboniferous sedimentary basins north and south of the Highlands and in the contact areas of Carboniferous granites with Devono-Carboniferous volcanic rocks within the Highlands.

Surficial Deposits Project

Research on surficial deposits is designed to describe the glacial history of Nova Scotia, the geochemistry of the glacial deposits and the location of potential buried mineral deposits. By studying how glaciers have moved, the materials they have transported and the chemistry the glacial deposits, exploration companies may be able to locate buried mineral deposits.

Glacial deposits of sand and gravel are the principal reservoir of water for many people in the province and the source of large volumes of sand and gravel (aggregates) used in construction. Work on this project has assisted many government agencies defining potential land use as well as outlining water and aggregate resources.

Field Mapping in the Annapolis Valley. During the 1988 field season, the glacial geology of the Annapolis Valley was mapped to provide an up-dated information base for this region.

Data and Word Processing Assistance Project

The purpose of the project is to assist the Mineral Resources Division to acquire more convenient and timely access to electronic data processing facilities.

Most of the personal computers now in use are supporting multi-task users including word processing, database and spread sheet analysis. Staff members in the Mineral Resources Division and other divisions have the benefit of tutorial sessions for learning the use of the hardware and software as well as regular user meetings to share experience gained through various applications. The continuing need for exposing as many departmental staff to computers is a major component of the on-going training and information strategy.

MINING ENGINEERING DIVISION

P. W. Phelan, PEng, Director

INTRODUCTION

The Mining Engineering Division is responsible for the administration and regulation of the mining industry in the province on behalf of the Department of Mines and Energy. The Division provides a diamond-drilling service to Department geologists and is responsible for maintaining Department vehicles and the equipment and facilities needed for drilling.

SIGNIFICANT EVENTS IN 1988-89

The Cape Breton Development Corporation's new Phalen Colliery produced in excess of 1 000 000 t of coal during its first full year in production. Production was interrupted for several days in both the Phalen and Lingan Collieries due to an inflow of water from an aquifer. Production was suspended in all the Corporation's mines from 25 January 1989 to 13 April 1989 because of a strike by the railway and shop workers.

Westray Coal Inc. has been granted a mining lease to extract coal from the Foord Seam in the Pictou coalfield. Site preparation and excavation for the mine portals have commenced and construction of the access slopes to the coal seam will commence shortly.

The situation at the Rio Kemptville Tin Corporation mine at East Kemptville continued to improve. Tin recovery has improved, the production of copper and zinc concentrates has increased and the prices for all these metals has improved substantially. The company carried out an aggressive research program to improve recovery and concentrate grades. A tin flotation plant is under construction and will be commissioned in May 1989. This improvement should increase the tin recovery to approximately 75 per cent.

During the year, eight companies extracted large bulk samples from 12 sites for gold, limestone, silica and magnetite. Details of the bulk sampling conducted in 1988 are shown in Table 1.

The Division has established a program to rehabilitate abandoned mine sites. The first two projects that will be undertaken are stabilization of the old tailings dam at the Stirling mine site in Richmond County, and a study of the revegetation of the Stirling and Yava tailings areas near Loch Lomond, Richmond County.

Illegal coal mining in Cape Breton continues to be reported. The Division, in co-operation with the Royal Canadian Mounted Police, are actively pursuing the problem.

TABLE 1. Bulk sampling conducted during the 1988-89 fiscal year

Company	Location	County	Mineral	Tonnage Mined
Coxheath Gold Holdings Limited	Tangier	Halifax	Gold	26 000 t
Kelrock Limited	Glendale	Inverness	Limestone	500 t
	Glen Morrison	Cape Breton	Limestone	500 t
Lodestone Limited	Bass River	Colchester	Magnetite	2 000 t
Northumberland Mines Limited	Cochrane Hill	Guysborough	Gold	6 700 t
NovaGold Resources Inc.	Fifteen Mile Stream	Halifax	Gold	6 000 t
Nova Scotia Sand and Gravel	Shubenacadie	Colchester	Silica	1 100 t
Onitap Resources Inc.	Goldboro	Guysborough	Gold	5 000 t
Seabright Explorations Incorporated	Beaver Dam	Halifax	Gold	40 000 t
	Caribou	Halifax	Gold	2 360 t
	Forest Hill	Guysborough	Gold	42 500 t
	Moose River	Halifax	Gold	35 600 t

Mining Engineering Section

D. S. Jones, PhD, PEng, Manager

The Mining Engineering Section is responsible for ensuring that the province's mineral and energy resources are utilized to their optimum, and that mining operations are conducted in a safe, efficient and environmentally acceptable manner.

This includes reviewing proposals from industry for new mining projects or modifications to existing mines, and making recommendations for the issuing of mining leases and permits. The Section also provides technical advice and assistance to industry and government on mining problems, and conducts economic and feasibility studies for new mineral projects.

Drill and Mechanical Section

D. MacNeil, Manager

The Drill and Mechanical Section is responsible for operating the Department's diamond-drills and maintaining all vehicles and mechanical equipment.

The amount of drilling completed by the Department during the last several years is shown in Table 2. Details of drilling during the 1988-89 fiscal year are given in Table 3. Further details for individual holes are given in the annual publication *Drill Logs of Government Core Drills.*

TABLE 2. Annual drilling statistics

Fiscal Year	Number of Holes	Amount Drilled Feet	Metres
1984-85	27	17,434	5 314
1985-86	14	20,538	6 260
1986-87	61	19,203	5 853
1987-88	38	17,623	5 371
1988-89	38	20,164	6 146

TABLE 3. Departmental drillholes completed during the 1988-89 fiscal year

		No.		Drilled	
Site Name	Map Ref.	Holes	D.D.H. Designation	Feet	Metres
Alton	11 E 03	1	ALT-87-1	2,241	683.1
Glencoe	11 F 14	15	GLENCOE-88-1 to 15	5,140	1566.7
Lake Ainslie	11 K 03	1	LAN-88-1	215	65.5
Lower Maccan	21 H 16	1	LMA-88-1	1,425	434.3
Marble Mountain	11 F 14	5	MM-88-1 to 5	1,314	400.5
Nictaux	21 A 14	3	NTX-89-1 to 3	383	116.7
Pictou	11 E 10	2	PIC-88 1 & 2	1,162	354.2
South Athol	21 H 09	2	SA-88 1 & 2	6,620	2017.8
South River Lake	11 F 05	1	SRL-89-1	194	59.1
Springhill	21 H 09	2	UR-88-1 & SS9	700	213.4
W. Erinville	11 F 05	5	ERV-88-1 to 5	770	234.6
	TOTAL	38		20,164	6145.9

MINERAL DEVELOPMENT DIVISION

D. A. Murray, MSc, Director

The Mineral Development Division is divided into two section, the Resource Geology Section and the Mineral and Petroleum Titles Section. The responsibilities of the Division lie in the orderly development and promotion of the province's mineral resources. Included in these responsibilities are mineral resource regulations, mineral titles policies and assistance in the promotion and development of all minerals. It also maintains geological information through the departmental libraries and drill core library. The Division monitors mineral production and mineral exploration activity in the province and provides liaison among mineral producers, exploration research establishments, landowners and government agencies. The Division also collects and compiles mineral production and exploration statistics.

Mineral and Petroleum Titles Registry

R. Ratcliffe
Registrar of Mineral and Petroleum Titles

The Mineral and Petroleum Titles Registry is responsible for receiving applications for mineral and petroleum rights and for issuing and registering the licenses or leases. In addition, any documents affecting licenses, such as transfers of title, assignments of interest, option agreements, special licenses and exploration agreements, are registered by this office. The Registry also receives all statements of exploration expenditures and assessment reports that pertain to the renewal of licenses and leases. Maps showing the disposition of lands under license or lease are maintained and continually updated. These maps are available for a nominal charge. Applications for underground gas storage rights and treasure trove licenses are also processed by this office. Information concerning production and employment in Nova Scotia's mines and quarries is received and tabulated by the Registry and published annually by the Department.

A large number of inquiries from industry, the public and other government departments are answered each year. Most deal with procedures for obtaining licenses, information on past exploration and mining activities, statistical information on production for operating properties and general questions about licenses. The Registry is responsible for all fees, bonds and other monies due for licenses, leases, statutory work deposits, payments in lieu of work and the sale of claims reference maps and copies of legislation from the Halifax office library.

The Registry maintained a high level of activity in 1988 (Table 4). In total, 1,342 exploration and development licenses (Fig. 3) were issued to 247 licensees for a total of 34,921 claims or 565 293 ha. Eight-one transfers were processed and 42 agreements received. During 1988, a record total of $29,612,886 in assessment work was reported to have been conducted in the province (Table 4). The Department's estimate of total expenditures for exploration and development work were down from 1987 but were at least $35 million (Fig. 4). In support of this reported work, 414 assessment reports were received in 1988. Registry staff participated in the review of the *Mineral Resources Act* and proposed regulations thereunder. The Coal Gas Regulations under the *Petroleum Resources Act* were brought into force in December of 1987. In total, four exploration agreements were maintained in 1987 by three companies for 1 449 179 ha. One coal gas exploration agreement was issued in 1988 to one company for 74 560 ha.

During the winter of 1988, registry staff were involved in streamlining procedures by means of automation of the registry system. An automated titles system will probably be in full use in 1989.

Resource Geology Section

J. M. Bingley, BSc, Manager

INTRODUCTION

The Resource Geology Section of the Mineral Development Division works with industry, educational institutions, other government agencies and the public to promote a strong mineral industry and to provide geological and geostatistical information and services. The personnel needed to perform these functions comprise geologists, planners, planning technicians, mineral technicians, librarians and secretaries, fifteen of whom are situated in the Halifax office and eight in the Stellarton office. An additional six or more student assistants and casual employees are hired for the summer months and to provide peak-time assistance.

TABLE 4. Mineral exploration trends in Nova Scotia.

		1981	1982	1983	1984	1985	1986	1987	1988
SUMMARY (onshore)									
Value of Reported Assessment Work ($)		8,441,270	4,100,000	4,200,000	2,625,666	2,389,351	9,954,014	26,713,524	28,612,886
Exploration Expenditure ($)		14,608,000	5,553,000	7,000,000	7,300,000[1]	8,000,000	20,000,000[1]	45,000,000[1]	35,000,000
Total Licences Issued		1,852	1,298	1,350	1,039	1,023	1,306	1,965	1,342
CLAIMS RECORDED ONSHORE[2]									
Base Metal	claims	68,863	39,626	40,630	26,627	27,809	36,714	53,516	31,860
	acres	2,754,520	1,585,040	1,585,040	1,065,080	1,112,360	1,468,560	2,140,640	1,274,400
	hectares	1 114 730	648 871	657 708	431 032	450 166	594 318	866 305	515 742
Uranium	claims	6,225	--[3]	--[3]	--[3]	--	--[3]	--	--[3]
	acres	249,000	--	--	--	--	--	--	--
	hectares	100 769	--	--	--	--	--	--	--
Salt, Potash	claims	5,225	1,065	505	1,257	830	192	--	232
	acres	209,000	42,600	20,200	50,280	33,200	7,680	--	9,280
	hectares	84 581	17 240	8 175	20 348	13 436	3 108	--	3 756
Coal	claims	4,880	3,072	4,565	3,584	3,584	482	1,682	2,828
	acres	195,199	122,880	182,598	143,360	143,360	19,280	67,280	113,180
	hectares	78 996	49 729	73 897	58 017	58 017	7 803	27,228	45 785
Number of Mineral Assessment Reports		150	124	188	127	108	154	238	414
Total Areas Held	acres	3,212,520	1,827,840	1,827,890	1,258,720	1,288,920	1,495,520	2,207,820	1,398,840
Under Licence	hectares	1 379 085	700 210	739 781	509 387	521 610	605,228	893,533	565,203
PETROLEUM LICENCES ISSUED									
Land Areas	licences	90	68	93	106[4]	--	3	4	3
	acres	6,230,046	5,419,852	8,048,306	8,567,701[4]	--	3,996,026	3,582,255	3,766,483
	hectares	2 521 265	2 193 424	3 257 104	3 467 338[4]	--	1 617 170	1 449 710	1,524,270
Submarine Areas	licences	172	168	--	--	--	--	--	--
	acres	34,786,100	33,865,867	--	--	--	--	--	--
	hectares	14 077 781	13 745 786	--	--	--	--	--	--

[1] estimate from Nova Scotia Department of Mines and Energy sources
[2] claims are 40 acres or 16.2 ha each
[3] uranium exploration and mining moratorium in effect
[4] as of July 1, 1984

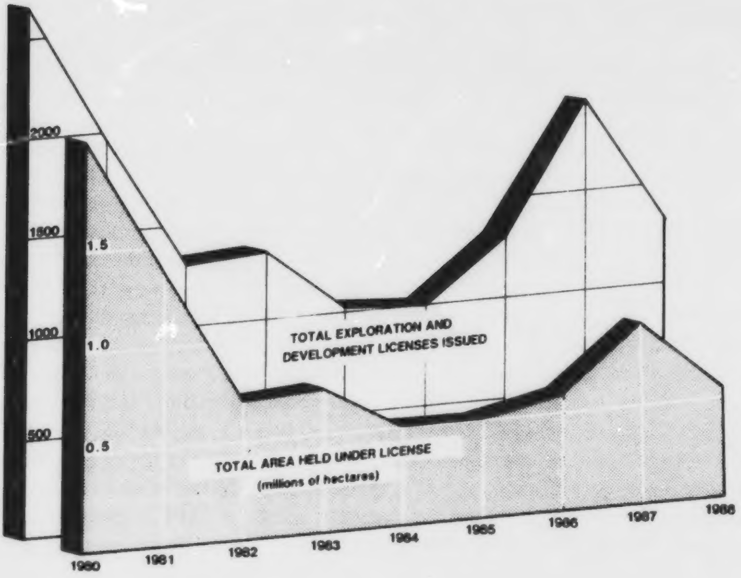


FIGURE 3. Trends in mineral exploration and development

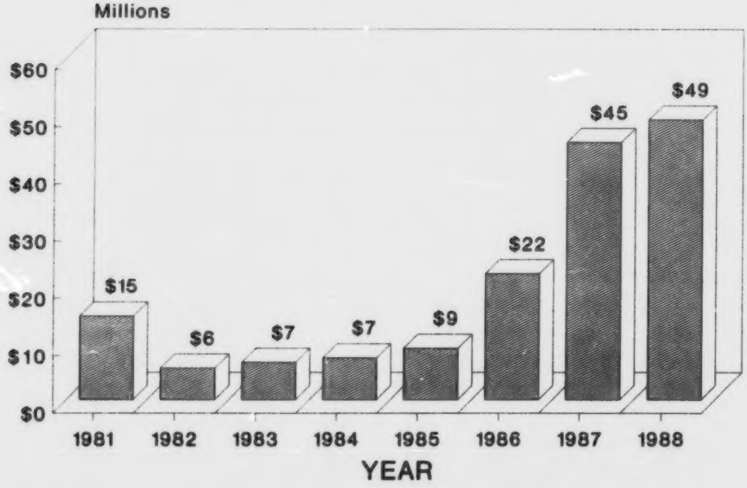


FIGURE 4. Trends in expenditures for mineral exploration

The Canada—Nova Scotia Mineral Development Agreement will terminate on 31 March 1989. Eleven of the 23 Mineral Resources Section staff are dependant on renewal of the Agreement for continuation of their projects (Land Use Policy Development, Building Stone, Gypsum/Anhydrite, Mineral Occurrence Database and Core Library). The locations of Mineral Development Division projects are shown in Figure 5.

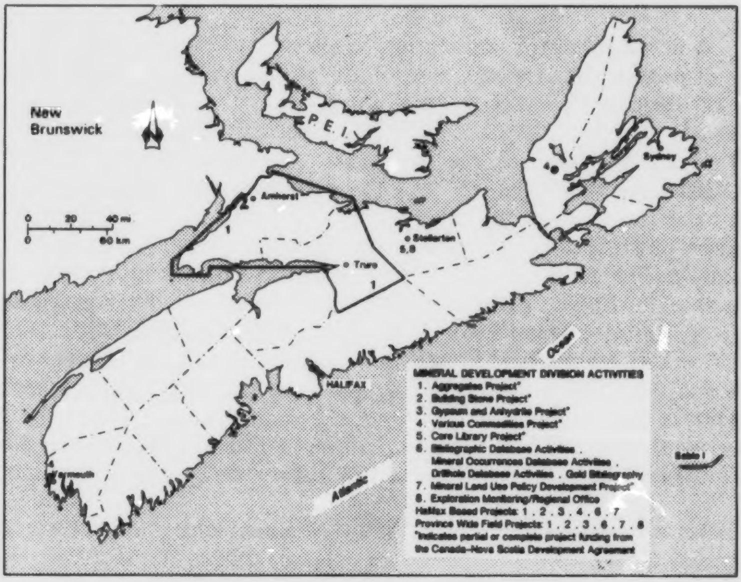

New Brunswick
P.E.I.
0 20 40 mi
0 60 km
Amherst
1
2
Truro
1
Stellarton
5,8
Sydney
4,8
HALIFAX
Yarmouth
Ocean
Atlantic
Sable I
MINERAL DEVELOPMENT DIVISION ACTIVITIES
1. Aggregates Project*
2. Building Stone Project*
3. Gypsum and Anhydrite Project*
4. Various Commodities Project*
5. Core Library Project*
6. Bibliographic Database Activities, Mineral Occurrences Database Activities, Drillhole Database Activities, Gold Bibliography
7. Mineral Land Use Policy Development Project*
8. Exploration Monitoring/Regional Office
Halifax Based Projects: 1, 2, 3, 4, 6, 7
Province Wide Field Projects: 1, 2, 3, 6, 7, 8
*Indicates partial or complete project funding from the Canada-Nova Scotia Development Agreement

FIGURE 5. Locations of Mineral Development Division projects

HALIFAX OFFICE ACTIVITIES

The Halifax staff of the Resource Geology Section are located on the third floor of the Founders Square Building, 1701 Hollis Street, together with the Registry of Mineral and Petroleum Titles.

Functions and services provided by the section in the Halifax office are:

- maintenance of the departmental library which consists of extensive geological, mining and energy-related materials and is open to the public,

- industrial minerals research (Building Stone, Aggregates and Gypsum/Anhydrite Projects) and assistance to industry,
- compilation and publications of various mineral inventory databases (GEOSCAN, drillholes, mineral occurrences, etc.),
- compilation of databases and maps for the Land Use Policy Development Project, and
- preparation for publication or open file release of completed project reports and maps and various types of information circulars, pamphlets, catalogues, etc.

INDUSTRIAL MINERAL PROJECTS

In 1988-89 final reports for the Fillers and Extenders Project and the Diatomite Project were written and edited and these reports will be available in 1989. Field work was completed on the Aggregate Project, Building Stone Project, Gypsum and Anhydrite Project and the Various Commodities Project and report writing is well underway. All six projects were funded under the Mineral Development Agreement.

Eighth Industrial Minerals International Congress

A delegation from the Department attended the 8th Industrial Minerals International Congress in Boston, 24-27 April 1988. A paper, Nova Scotia - North America's Doorstep to Industrial Mineral Opportunity was presented by Dr. R. R. Potter, Assistant Deputy Minister, Mines and Minerals. The presentation portrayed Nova Scotia as a world class industrial minerals producer and a province with many excellent resource development opportunities. Along with the presentation the Department had a 6 m x 2.5 m display at the Congress showing Nova Scotia's thriving industrial minerals industry and abundant resources which are well located (geographically) to access markets anywhere in the world.

Industrial Mineral Properties for Development

In 1988 the Department called for development proposals on three industrial mineral properties including the Chegoggin Point silica deposit, Yarmouth County, the Scotsville barite deposit, Scotsville, Inverness County, and the Diogenes Brook silica sand deposit, Melford, Inverness County.

Federal/Provincial Industrial Minerals Meeting

In October 1988 the senior industrial minerals geologist, attended the Federal/Provincial Meeting of Industrial Minerals Specialists held at the Geological Survey of Canada Building in Ottawa. He presented a paper: Review of Industrial Mineral Activities in Nova Scotia, 1987—1988.

Prospectors and Developers Association of Canada

At the 57th Annual Convention of the Prospectors and Developers Association of Canada in Toronto, 5-8 March 1989, the senior industrial minerals geologist presented a paper: Industrial Mineral Mining and Development Opportunities in Nova Scotia. The presentation was well attended and a lot of new interest was generated in Nova Scotia's industrial mineral resources. The presentation was supported with a display promoting Nova Scotia's industrial mineral resources.

Building Stone Project

Introduction. Building stone is a term applied to a natural rock that has been quarried and shaped to meet specific requirements for use in the construction, building and monument industries. It includes such rock types as sandstone, granite and marble.

Three years of fieldwork have been completed with positive results. Wallace sandstone was used for the first time in many years in the restoration of Province House. The Province House restoration project, completed in late 1987, utilized 100 m^3 of sandstone and resulted in the successful training of 12 apprentice stone masons over a 2.5 year period. The mason apprentices are currently working on restoration of the Dominion Building, which will become the Art Gallery of Nova Scotia. Over 100 m^3 of sandstone from Mary's Point, New Brunswick, are required for this restoration project. In addition, 450 m^3 of Nictaux grey granite and an imported black granite are being used for flooring, cladding and a series of planters, resulting in a unique showcase for the international art community. In the coming years many other sandstone buildings will be restored in Nova Scotia and other parts of North America, resulting in a renewed life for Nova Scotia sandstone quarries and the newly-trained restoration stone masons.

Sandstone Deposits. Work on sandstone deposits was completed during the first phase of this project. Many old quarries were visited and sampled and some were core drilled. Four deposits have been selected as the best development opportunities. The Wallace Quarry, Cumberland County, produces the best known Nova Scotia sandstone and has been an intermittent building stone producer for over 75 years. Core drilling in late 1986 extended the reserves of olive and grey sandstone to 10 000 m^3 and 32 800 m^3 respectively. The owner stripped a large area of overburden in late 1987 to expose stone for production in 1988.

The Amherst sandstone deposit, although dormant for 50 years, contains an estimated reserve of 27 300 m^3 of excellent quality red sandstone, as indicated by drilling.

A deposit of grey sandstone located at Eight Mile Brook, Pictou County, contains a drill-indicated reserve of 25 800 m^3 of sandstone.

A new sandstone quarry was opened at Hardwood Hill, Pictou County, in 1987 to supply shot rock and fill for a local common-user dock project. Diamond-drilling has outlined the presence of tan and olive sandstone in the Hardwood Hill quarry which may be suitable for building stone.

Granite Deposits. Granite deposits suitable for building stone have been exploited for many years in Nova Scotia. Heritage Memorials Ltd. extract granite from a quarry at Nictaux, Annapolis County, for use as monument blanks and bases. Their annual production is over 500 m^3 of a fine grained grey granodiorite.

A white biotite monzogranite was identified at Terence Bay, Halifax County, and diamond-drilled by the Nova Scotia Department of Mines and Energy in 1987. Over 223 000 m^3 of stone were outlined in an area suitable for quarry development.

Grey granodiorite was quarried in several locations in the Halifax area. A site at Quarry Lake has good potential for further development as reserves appear to be large.

A fine- to medium-grained biotite-muscovite granodiorite was quarried in Shelburne on a regular basis until the early 1960s. Although the old "Island Park" quarry has been filled in, other development opportunities exist in the region.

Limestone (marble). The 1988 field program has concentrated on an evaluation of the Glencoe limestone deposit for suitable white and banded marbles for use as building stone. Work was carried out on two areas on the east and west sides of the deposit. Five holes totalling 401 m were collared on a white marble on the northeast corner of the Glencoe deposit. A predominantly white to pale blue banded marble was cored for a total thickness of 213 m. Previous drilling indicates that the strike length of the white unit could be 305 m or more. Drilling on the west side of the deposit has outlined a band of white marble about 23 m in thickness with a strike extent of over 150 m.

Gabbro (black granite). Small quantities of black gabbro were produced from a quarry at Erinville, Guysborough County, in the early 1960s. A local monument fabrication company manufactured over 100 monuments using the stone. As a result of field mapping, two areas were selected for diamond-drilling. Five holes totalling 235 m were collared on a gabbro plug near the old Erinville quarry. The results of this work outlined the boundaries of the plug and suggest that certain areas may be suitable for quarrying.

One hole was drilled at a second gabbro plug at South River Lake, Antigonish County. The gabbro was highly fractured with abundant serpentine veinlets and is unsuitable for use as building stone.

Nictaux Granites. Two sites were selected for evaluation by diamond-drilling near the village of Nictaux, Annapolis County. Three holes totalling 117 m were collared in the Heritage Memorial Ltd. quarry at Nictaux.

The results of this work suggest that the granite in the central and western part of the property has the best characteristics for monumental stone. The joint pattern in this quarry, combined with the presence of quartz pegmatite and aplite veins, have made the quarrying of large blocks very difficult. The presence of xenoliths (black knots) also results in a high waste factor.

Three holes totalling 62 m were drilled on the Robert Baltzer property located 2 km west of the Heritage quarry. The granite cored was similar to rock in the Heritage quarry, both in composition and joint frequency. The possibility of quarrying large blocks seems to be remote in the area tested to date by drilling.

Gypsum/Anhydrite Project

Commencing in June 1985 the Gypsum/Anhydrite Project was initiated as part of the Mineral Development Agreement to produce an inventory of the gypsum and anhydrite resources of the province. Additionally, it has been the aim of the project to increase and enhance relations between the Department and the province's present producers, as well as to initiate and support development of alternative utilization of Nova Scotia's gypsum and anhydrite resources.

Field checking of surficial gypsum occurrences was completed during the 1988 field season. Virtually all known gypsum and anhydrite surface occurrences have now been located and sampled. Field data are presently being compiled along with subsurface information from assessment reports and Open File Reports available within the Department to present concise reports on each occurrence.

Results of a small drilling program carried out in 1986 have been released as OFR-88-057 entitled *Gypsum, Anhydrite Potential, Meadows Road Area, Cape Breton County*. Interest in the area has already been shown by at least one company.

Utilization of anhydrite in coal mine gateside packs moved slowly closer to reality with the establishment of a facility in Cape Breton, capable of producing a suitable material. Surface trials are scheduled to begin shortly and underground trials will quickly follow. By year's end funding was in place to further investigations at the Technical University of Nova Scotia on anhydrite-based products. Phase II of these studies will determine the suitability of using anhydrite in board products and floor screeds.

The gypsum/anhydrite project is now in the final report writing stage. Preliminary write-ups for all occurrences will be completed shortly.

Aggregate Resource Project

The areas of focus for the aggregate resources program during 1988 were northern Nova Scotia, where the field investigation was completed, and the Halifax-Dartmouth region, where a new study is in progress.

Northern Nova Scotia. The northern Nova Scotia project, which consists of a detailed evaluation of the aggregate potential in Cumberland and Colchester Counties, is in its final stages following two years of investigation. This year the field season consisted of completing the remaining field work on Quaternary sediments as well as conducting follow-up investigations on some of the more promising deposits. The bedrock potential was examined throughout the region. This included the sampling and testing of older rocks in the Cobequid Highlands at several locations and the examination of Carboniferous conglomerates and carbonates. Data from 180 sample locations are being compiled and a report with maps is currently being generated.

The results of the study indicate the presence of several previously unidentified kame and esker deposits in the region. Of special interest are the fan-shaped modern stream deposits observed in the Parrsboro area. Recent testing of these alluvial gravels indicate that they are high-quality materials which may offer alternatives in an area where the aggregate sources are generally poor. Furthermore, their discovery should offer new exploration targets in other areas of the province in the future.

Halifax-Dartmouth. The Halifax-Dartmouth project was initiated because of (1) conflicts between the aggregate industry and residential interests, and (2) the decline of available resource land due primarily to increases in population density. The emphasis of the project is the identification of bedrock areas surrounding metro where crushed stone aggregate quarries might be developed.

The preliminary work for the study is complete and consisted of (1) a literature search, (2) an examination of land ownership, (3) field checking of some potential areas, and (4) preliminary contact with the local aggregate producers. The majority of the investigation will be conducted in the new year.

Various Commodities Project

Work on the Various Commodities Project involved continued updating and improving of the database on several industrial mineral commodities. These commodities include andalusite, barite, beryl, brucite, dolomite, garnet, graphite, limestone, silica, spodumene, talc, topaz and wollastonite.

After an initial period of data compilation and field investigations, deposits with excellent potential for development were selected for more detailed work in order to provide the necesary information to promote new resource development opportunities in Nova Scotia. The Chegoggin Point, Yarmouth County, silica and garnet deposit was investigated in detail in 1987/88 and the Glencoe limestone/dolomite deposit has been further investigated by diamond-drilling and bulk sampling this year. The Glencoe deposit, as well as other Nova Scotia limestone/dolomite deposits with large reserves, has been the focus of a lot of attention by various interests recently. This increased exploration activity has led to the development of a few of the higher CaO deposits and the outlook for future development of others is very encouraging.

A report outlining the various commodities evaluated during this project is nearing completion. This report includes information on occurrences in Nova Scotia with high development potential based on current markets and resource accessibility.

METALLIC MINERALS

Gold Resource Inventory Project

The field and library research component of this Mineral Development Agreement project was concluded in May 1987. Consulting geologist/editor Katherine Mills was retained on a part-time basis, beginning in March 1988, to prepare project geologist Craig Miller's draft report as an open file release. This report is now in the final draft stage.

MINERAL LAND USE POLICY DEVELOPMENT

The Department initiated a *Land Use Policy Development Project* to encourage the protection and prudent use of lands underlain by mineral and energy resources, and to provide input to future land use planning. A growing concern for the Department as a resource manager is an increasing occurrence of conflicting land use issues surrounding mineral exploration and development, including a gradual reduction of land access due to other resource management and municipal planning policies. The amount of land accessible to exploration has a direct bearing on the overall potential for the discovery of Nova Scotia's mineral and energy wealth. Through the Land Use Project the Department is taking steps to avoid any unnecessary preclusion of use of lands that have known mineral and energy resource potential. Issues of land access and land use converge when municipal plans are adopted that inadvertantly guide community development over or near potential deposits of mineral and energy resources. There is a concern that municipal land use policies and by-laws are not adequately accounting for mineral resource potential lying hidden below the surface.

Through the Canada Nova Scotia Mineral Development Agreement, the Department is attempting to generate better understanding of Nova Scotia's mineral and energy resources by industry, the public and other provincial departments. The Land Use Policy Development Project has been developed to channel mineral resource information to the provincial and municipal planning community.

A three phased approach has been defined to carry out the project:

- Phase one - Information gathering and creation of MINLU -a mineral land use information base. Products include a series of 18 Mineral Resource Land Use maps and handbooks.
- Phase two - Mineral potential mapping of Nova Scotia.
- Phase three - Land use policy recommendations concerning mineral, aggregate and energy lands. Groundwork will be laid for the adoption of provincial land use policy in accordance with section 7 of the Planning Act.

Survey on mineral resources and land use

A survey was conducted to determine the mineral resource and earth science information needs of the planning community. Twenty-eight of 32 questionnaires distributed were completed and returned.

Nearly 80 per cent of Nova Scotia lies within municipal areas that have or will have land use plans in effect, clearly indicating that land use management and planning is becoming an important issue for all levels of government. Land use conflicts will likely arise as more areas under municipal plans expand to cover potential mineral and energy lands. Without suitable geological information made available to municipal planning offices, local land use plans and by-laws may be prepared that reduces or prevents accessibility for mineral exploration and could permanently preclude development.

Most of the municipal units surveyed have little or no regulatory control over pit and quarry activity. Only 36 per cent indicated they have some measure of control in the form of Gravel Pit By-Laws (Municipal Act s.191 (60A)) which require operators to apply for excavation permits. These by-laws have limited controls and are mainly used to ensure restoration of excavated sites. In some areas pit and quarry operators are subject to several other permits which control topsoil removal, blasting, building construction and occupancy.

Municipalities have no direct control over the location of extraction operations. A precedent set by Ontario Case law, upheld by Nova Scotia, rules that aggregate extraction is not a 'use' of land. Without this provision the municipalities cannot conduct land use planning, develop policy or zoning to either prevent or protect existing and future resource extraction operations.

The survey found there is a considerable need for detailed and pertinent geological resource data by planners. Nearly 86 per cent of survey respondents indicated that the availability of mapping that locates and classifies mineral, aggregate, and coal resources is poor and needing improvement.

Planning issues related to mineral resource activity fall into three broad catagories; environmental, health and safety, and land use planning.

A Provincial Land Use Policy is the preferred approach to solving these issues, and it is suggested that provincial resource departments become more involved in the land use planning process. The Province should have a supportive and directive role by providing local authorities with resource information necessary to make informed decisions regarding proper land use.

The Land Use Policy Development Project is working to provide Nova Scotia's municipalities with mineral resource land use mapping and other materials to provide input to the municipal land use planning process.

Mineral Resource Land Use Maps and Handbooks

Mineral Resource Land Use maps sets have been compiled and released for Halifax County (OFM 88-001 to 88-012); Hants County (OFM 88-017 to 88-022); Cape Breton County (OFM 88-033 to 88-038); and Kings County (OFM 88-044 to 88-049). Maps in preparation include the Lunenburg County set (OFM 89-005 to 88-009). Handbooks in preparation include Nova Scotia; Halifax County; and Hants County. A Preliminary Design Brief was prepared to guide the future publications program.

Mineral Land Use Database - MINLU

The development of MINLU is ongoing. Land use and resource management bibliographic information is being input to a network data base (REVELATION). Digital map data is being input to an ATLAS MAPEDIT program.

Aquaculture. The staff of the land use planning project has the responsibility of reviewing applications for aquaculture licenses and experimental permits. This review process allows the department to screen proposed aquaculture sites for potential conflict with the exploration and mining sector. This is in keeping with the necessity to monitor all land and near-shore resource activity so as to maintain a relatively conflict-free land management practice. This year 112 aquaculture license and lease applications were reviewed.

Mineral Resources and Planning. The land use staff receive requests for mineral resource information from planners and planning consultants. Several information packages with reports and maps have been prepared for input to specific land management plans and projects. These include, utility corridor planning; site locations for ash disposal, a power plant, a proposed Gaelic College, and an Integrated Resource Management Study for Bras d'Or Lakes.

Terms of Reference were defined for a Mineral Development Agreement, EMR-funded study on cost effective methodologies for Pit and Quarry Reclamation in Nova Scotia. Emphasis was given to ideas encouraging integration of the environment and economy regarding the after use of mined land. The contract was awarded to Gardner Pinfold and Associates.

Provincial Planning. The Land Use Group also participates and contributes to several activities and developments in provincial planning. Along with providing input to papers and policy produced by the interdepartmental committee on land use, the group is active on Voluntary Planning's Land Resources Coordinating Committee, and is currently participating in a sub-committee concerning land use management and development. Staff also records and monitors changing land use, such as the designations of ecological reserves and surface watersupply watersheds.

Presentations

Presentations on the Land Use Project were made to: NSDME Open House and intra-departmental groups; Provincial Land Use Policy Committee; Halifax County (Policy Committee); Municipal Affairs (Provincial Planning Committee); Nova Scotia Voluntary Planning (Land Resources Coordinating Committee).

LIBRARY SERVICES

The Department maintains two technical libraries. A main library is located in the Halifax office with a branch library in the Stellarton office. Holdings include more than 8000 maps, 4500 exploration assessment reports, 860 open file reports, 1000 open file maps, 600 theses, 1200 journal literature references, 240 journals, and trade magazines, more than 3000 reference texts and hundreds of government documents. The libraries function as important resource centres for information on the geology, energy resources and mining history of Nova Scotia. To this end, the libraries provide the following services and facilities:

- reference and information service to the general public, provincial government personnel, professional geoscientists, engineers and consultants in private industry,
- sale of departmental and Geological Survey of Canada publications and maps,
- catalogued and classified files of the library holdings, including exploration assessment reports, open file reports, open file maps and theses,
- a mailing list of individuals, institutions and corporations that wish to be informed of our activities and publication releases,
- facilities for photocopying, microfiche reading and printing and for making white print duplicates of maps, and
- sale of federally and provincially published topographic maps (Stellarton only).

The main library in the Halifax office continued to be busy with an increased demand for information services and products during fiscal year 1988-89. The acquisition of energy related books plus the increase in mineral exploration activity in Nova Scotia led to a continued increase in the workload of the main library. 635 new books were catalogued this year. As a result of funds obtained from the CNSMDA a person was hired to initiate the indexing program for the library database. During this period 2000 records were coded and 1200 records entered into the database. More than 2000 people (excluding staff) made use of the library facilities. In addition, 1000 telephone inquiries and 1000 mail inquiries were answered.

Revenue from the sale of more than 2500 maps, 8000 pages of photocopying, 6000 pages of microfiche prints and 600 white prints totalled $16,900, while sale of departmental publications generated $10,000. More than 15,000 publication release notices were mailed out, as well as 600 announcements for our annual open house and over 800 annual reports. 333 interlibrary loans were processed and over 285 orders for books and supplies were placed.

MINERAL INVENTORY

The Mineral Inventory group is responsible for the collection, verification, organization, and dissemination of mineral resources information. The main functions of the group are threefold, namely: to verify that submitted exploration assessment reports comply with the Rules and Regulations of the Mineral Resources Act for the purpose of renewing exploration licenses; to establish and maintain databases of mineral resources information; and to publish pertinent compilations of mineral resources information for use by the Department, other government agencies, the mineral exploration industry and the general public.

As a result of funds obtained from the Department and the CNSMDA, two major projects involving five people were in operation during fiscal year 1988-89. These projects were GEOSCAN Bibliographic Database and Metallic Mineral Occurrences Database.

Bibliographic Database. Indexing and on-line data entry into GEOSCAN continued throughout fiscal year 1988-89 for Nova Scotia Department of Mines and Energy bibliographic records. GEOSCAN is a bibliographic database which provides access to publicly available geoscience literature concerning the Canadian landmass and offshore regions. The database presently contains over 125,500 records, and is co-operatively produced from the indexing contributions of 14 federal, provincial and professional geoscience organizations located throughout Canada. The Geological Survey of Canada, through the National GEOSCAN Centre, co-ordinates these indexing activities and provides computer resources in support of this project.

In fiscal year 1988-89, 653 new Department records were added to GEOSCAN. These records consisted of 380 assessment reports, 50 open file maps, 66 open file reports, 142 publications, 6 theses and 9 journal literature references, representing a 5.2 per cent increase in the Nova Scotia component of the database. As of March 31, 1989, the database contained 10,375 departmental records consisting of the following:

Assessment Reports	-	4,515
Publications	-	2,116
Journal References	-	1,273
Open File Maps	-	1,003
Open File Reports	-	867
Theses	-	601

Report 88-2 Index to Assessment Reports, Publications, Open File Reports and Open File Maps for 1987 was released in September 1988. The Index to 1988 Assessment Reports, Open File Maps, Open File Reports and Publications (Report 89-2) is in preparation and will be released in mid-1989.

Metallic Mineral Occurrences Database. In order to improve the quality and reliability of the data in the Metallic Mineral Occurrences data cards and database, the program of systematic reference researching and checking, coupled with selected field checking continued during fiscal year 1988-89. Two hundred and forty-six metallic mineral occurrence data cards were researched, and limited field checking was conducted in parts of the Cobequid Highlands, the Antigonish Highlands and Cape Breton Island. Two hundred and three data cards were revised and updated, 43 cards were eliminated from the dataset and 8 new metallic mineral occurrences were documented. Since this program began in fiscal year 1987-88, a total of 511 metallic mineral occurrence cards have been checked, 429 newly revised cards have been generated, 82 cards have been eliminated from the dataset and 20 new metallic mineral occurrences have been documented, covering the following map sheets: 11E, 21H, 11F/11,13 and 14 and 11K/2, 4, 6, 10 and 11.

A new metallic mineral occurrences database, based upon the information in the revised metallic mineral occurrences data cards, has been created using Advanced Revelation as the database management system software. Seventy metallic mineral occurrence records have been entered into this new database and this dataset is being used to test the suitability of Advanced Revelation as the appropriate software for this application.

MINERAL INVESTMENT STIMULATION PROGRAM (MISP)

Introduction

The Mineral Investment Stimulation Program is the jointly funded

Federal/Provincial vehicle designed to financially assist the private sector of the Mining Industry to develop or improve viable operations.

Assistance from the program is available for approved projects up to a maximum of $50,000 per project. Funding of projects is shared with the private sector on a "dollar for dollar" basis.

The maximum contribution from would, therefore, be met with an equal commitment of $50,000 from a qualified individual or company.

Approved projects are for such purposes as detailing established ore reserves, applying innovative processing techniques and investigating new marketing opportunities.

Procedure

Each application for funding, is assessed by a panel of appropriate experts drawn from the Department and Mines and Resources Canada. Once a project has received approval, the applicant enters into a legal agreement with the Province and the initial cash contribution is made.

Thereafter, the recipient submits interim and final reports, together with documentation of expenditures, to receive two further payments.

Benefits

The financial assistance extended under the program contributes revenue for the service industries in the short term and increased employment in the long term. Additionally, the program should create new domestic and export markets with all the attendant long term benefits.

Current Status

During the term of the Program extending from October, 1985 to March, 1989 a total of eighty-two (82) applications were received. Fifty-four (54) projects were approved of which eight (8) were not initiated for various reasons. A total of $1.65 million has been committed to assist these projects. To date twenty (43 per cent) have met with an encouraging degree of success.

Projects completed and in progress during this year under review are described in the attached status report.

Approximately $40,000 is budgeted for final payments to be made during the early months of 1989-90.

The following projects were cancelled during the 1988/89 fiscal year:

(a) A proposal to develop a new granite building quarry in the Halifax area;
(b) a plan to test a portable gold milling facility at Harrigan Cove;
(c) a program to conduct water control grouting i nthe Inverness area; and
(d) a proposal to conduct fill-in drilling on an established base metal deposit in Victoria County.

STELLARTON OFFICE ACTIVITIES

Part of the Resource Geology section shares a regional office with three other divisions in the department's building at 32 Bridge Avenue, Stellarton, Pictou County. Responsibilities and activities performed by staff of the Regional Exploration Services group include:

- liaison with and monitoring of the mineral exploration industry,

- annual surveys of all mining and exploration companies active in the province for statistical compilations of exploration, development and capital expenditures and drilling activity,

- supervision and operation of the drill-core library,

- in-house technical support services and expediting,

- field equipment storage and maintenance,

- storage of geotechnical samples; library services, including storage of assessment reports and other geotechnical data,

- storage, distribution and sales of departmental publications and maps, and sales of maps for Maritime Resource

Management Services and Energy, Mines and Resources Canada.

Regular permanent staff of this group consists of two geologists, one mineral technologist, one mineral technician and a stenographer/librarian. Term staff employed at the Core Library consist of a geologist and a mineral technician.

Exploration Monitoring

Monitoring of mineral exploration activity is carried out by the Resource Geology Section of the Mineral Development Division. Staff assigned to this program include a regional geologist and a project geologist based in the regional office in Stellarton.

The program of exploration monitoring provides a direct liaison with industry through which the department is able to maintain an awareness of current exploration activities throughout the Province. The monitoring process provides continuous contact with industry personnel through regular visits to company offices and exploration sites. Problems and difficulties that may need to be addressed by the Department are identified and assistance or advice is provided if necessary. In addition, the monitoring staff review assessment and other reports submitted by industry and carry out an annual statistical study of exploration industry in the Province.

Drill Core Library

The department's drill core library exists to preserve valuable drill core obtained from exploration and geological investigations carried out by both the department and the mining industry. The drill core stored in the library is available for use by industry geologists, departmental staff, Geological Survey of Canada geologists, university researchers and others who work towards a greater understanding and the continued development of the province's mineral resources.

Headquarters for the Core Library is located in the facility on Acheron Court in the Stellarton Industrial Park. Other core storage facilities are located in the Debert Air Industrial Park, at Malagawatch, Inverness County and at the regional office in Stellarton.

The official opening of the new headquarters building, constructed in 1987-1988 through Mineral Development Agreement funding, was held on April 25, 1988.

New acquisitions of drill core during the year totalled 56,200 ft. (17 129 m) from 156 holes drilled between 1985 and 1989, of which 75 per cent was donated by industry (Table 5). Currently the core library houses a collection of drill core totalling approximately 460 000 m at all locations. The core reduction program, funded through the Agreement, continued during the year with detailed evaluation of large quantities of core obtained from exploration programs in the Loch Lomond area of Richmond County and the Salmon River are of Cape Breton County.

During the year, two tractor-trailer lodes of palletised core was transferred from the Debert storage facility to Stellarton to provide additional storage space in Debert for rock and other geotechnical material storage. The Debert building will eventually be converted to sample storage while core storage will be centralised in Stellarton.

Sample Storage

Demand for greater storage space for geotechnical samples continued to increase during the year. Large volumes of rocks, tills and other materials were received fromthe South Mountain Batholith project and from several Industrial Minerals field projects, requiring utilization of parts of the Regional Office building in Stellarton, the Debert core storage building and the Core Library headquarters. A planned active storage area adjacent to the Core Library Headquarters, intended for bulk samples of several industrial mineral commodities had to be deferred pending adequate funding. The site was levelled in preparation for construction.

A narrow-aisle fork-lift was requisitioned for the Debert building to permit storage of samples on rocks to the full height of the building. Currently only floor storage of the sample containers is possible.

Technical Library

The Stellarton branch of the departmental library contains a complete set of microfiche of assessment reports and open files, as well as Mines and Minerals branch publications and maps, and many other books and periodicals. This library is open to the public during office hours.

Publications and Map Storage

The stockpile for the majority of the available departmental publications and maps is maintained in the Stellarton office, from which distribution to the Halifax office and the Nova Scotia Bookstore is made as required. The number of available publications continued to grow during the year. Original paper copies of assessment reports, open files and theses are also stored in the Stellarton office.

Map and Publications Sales

The Stellarton office library maintains for sale topographical maps produced by Maritime Resources Management Services, topographical, geological and airborne geophysical maps and geological reports produced by Energy, Mines and Resources Canada and a variety of geological and geochemical related maps and reports produced by this Department.

One mineral technician was employed on a full-time basis to provide expediting services. These services included delivery of equipment to, and setting up of, field camps for field geological parties and drill crews; transportation of samples, equipment and publications between Halifax, Debert and Stellarton, collection of drill core from departmental drilling projects and exploration sites, and delivery, set-up and manning of departmental displays for public functions. Storage, maintenance and repair of field equipment is also provided.

TABLE 5. Drill core acquisitions to the core library, Stellarton for the 1988-89 fiscal year

NTS	COMPANY OR ORGANIZATION	YEAR DRILLED	COMMODITY OR PROJECT	LOCATION	COUNTY	NO OF HOLES	HOLE NAMES	CORE SIZE	TOTAL FEET	TOTAL METRES
11-E-2	NovaGold Resources Inc.	1986-87	Gold	Fifteen Mile Stream	Halifax	17	N-86-11 to N-86-13, N-86-18 to N-86-20, N-87-27 to N-87-29, N-87-34 to N-87-40, N-87-42	NQ	6,674*	2 034*
11-E-3	NSDME, Mineral Resources Division	1988	Potash	Alton	Colchester	-	Alt-87-1 (continued from previous year)	NQ,BQ	525	160
11-E-5	Lodestone Ltd.	1987	Magnetite	Bass River	Colchester	6	1-6	NQ	667	203
11-E-8	Nova Construction Ltd.	1986	Gypsum	Brierly Brook	Antigonish	15	BB-86-1 to BB-86-33 (# 1,3,7,8,12,15,16,18 20,21,23,24,28,31,33 only)	NQ	935	285
11-E-10	NSDME, Mineral Development Division	1988	Building Stone	Sawmill Brook	Pictou	1	SMB-88-6	BQ	43	13
11-E-10	NSDME, Mineral Resources Division	1988	Geology	Pictou	Pictou	2	PIC-88-1, PIC-88-2	NQ,BQ	1,129	344
11-E-10	Pioneer Coal Company Ltd.	1986	Coal	Westville	Pictou	8	PC-86-1 to PC-86-3, PC-86-5 to PC-86-8, PC-86-12	NQ	289	88
11-E-10	Pioneer Coal Company Ltd	1989	Coal	Westville	Pictou	10	PC-89-1 to PC-89-10	NQ	1,522	464
11-E-10	Suncor Inc.	1985	Coal	New Glasgow	Pictou	5	AP-85-0381, AP-85-0383 to AP-85-0385, AP-85-0401	HQ,NQ	12,106	3 690
11-E-10	Suncor Inc.	1986	Coal	New Glasgow	Pictou	8	PCP-86-0411 to PCP-86-0418	NQ	4,865	1 483
11-E-12	Seabright Explorations Inc.	1986	Gold	South Farmington	Cumberland	10	SF-86-1 to SF-86-10	NQ	1,864	568
11-F-5	NSDME, Mineral Development Division	1988	Building Stone	West Erinville	Guysborough	5	ERV-88-1 to ERV-88-5	NQ,BQ	734	224
11-F-5	NSDME, Mineral Development Division	1989	Building Stone	South River Lake	Antigonish	1	SRL-89-1	NQ	177	54
11-F-14	NSDME, Mineral Development Division	1988	Building Stone	Glencoe	Inverness	5	Glencoe-88-1 to Glencoe-88-5	BQ	1,385	422
11-F-14	NSDME, Mineral Development Division	1988	Limestone, dolomite	Glencoe	Inverness	12	Glencoe-88-6 to Glencoe-88-17	BQ	3,638	1 108
11-F-16	AquaGold Resources Inc.	1989	Limestone	Glen Morrison	Cape Breton	11	GM-89-1 to GM-89-11	NQ	893	272
11-F-16	Tusk Minerals Inc.	1988	Base and precious metals	French Road	Cape Breton	1	TSK-88-1	NQ	308	94

TABLE 5. Drill core acquisitions to the core library, Stellarton for the 1988-89 fiscal year (continued)

NTS	COMPANY OR ORGANIZATION	YEAR DRILLED	COMMODITY OR PROJECT	LOCATION	COUNTY	NO OF HOLES	HOLE NAMES	CORE SIZE	TOTAL FEET	TOTAL METRES
11-K-1	Pioneer Coal Company Ltd.	1986	Coal	Reserve Mines	Cape Breton	5	X-86-1, X-86-3 to X-86-6	NQ	170	52
11-K-3	Chevron Canada Resources Ltd. and Irving Oil Ltd.	1988	Oil	Mull River	Inverness	1	Mull River No. 1	PQ	37	11
11-K-3	NSDME, Energy Resources Division	1988	Geology	East Lake Ainslie	Inverness	1	LAR-88-1	HQ,NQ	193	59
21-A-4	Acadia Mineral Ventures Ltd.	1987	Gold	Carleton	Yarmouth	10	CAR-87-1, CAR-87-3 to CAR-87-10	NQ	4,625*	1 410*
21-A-4	Acadia Mineral Ventures Ltd.	1988	Gold	Fanning Lake	Yarmouth	13	FL-88-1 to FL-88-13	NQ	6,421	1 957
21-A-4	Granges Exploration Ltd.	1988	Base Metals	East Kemptville	Yarmouth	1	K-88-1	BQ	196	60
21-A-4	Granges Exploration Ltd.	1988	Base Metals	East Kemptville	Yarmouth	1	K-4	BQ	395	120
21-A-14	NSDME, Mineral Development Division	1989	Building Stone	Nictaux	Annapolis	3	NTX-89-1 to NTX-89-3	NQ	369	112
21-H-8	NSDME, Energy Resources Division	1988	Coal	South Athol	Cumberland	1	SA-88-2	NQ,BQ	1,778	542
21-H-9	NSDME, Energy Resources Division	1988	Coal	South Athol	Cumberland	-	SA-88-1 (continued from previous year)	HQ,NQ, BQ	2,249	685
21-H-9	NSDME, Energy Resources Division	1988	Coal	Valley Road, Salt Springs	Cumberland	1	VR-88-1	NQ	150	46
21-H-8	NSDME, Energy Resources Division	1988	Coal	Salt Springs	Cumberland	1	SS-9(88)	NQ	479	146
21-H-16	NSDME, Mineral Resources Division	1988	Geology	Lower Maccan	Cumberland	1	LM-88-1	HQ,NQ	1,392	424
	TOTAL					156			56,208	17 128

Core acquired from departmental drilling program: 14,233 ft. (4 338 m) from 34 holes (11 projects)
Core acquired companies drilling programs: 41,967 ft. (12 791 m) from 122 holes (14 projects)

56,200 ft. (17 129 m) from 156 holes (25 projects)

*nominal footages only - up to 40% of core from some holes removed (without splitting) for analytical purposes

Core sizes (diameter):
BQ = 1.432 (36.5 mm)
NQ = 1.875 (47.6 mm)
HQ = 2.500 (63.5 mm)
PQ = 3.344 (84.9 mm)

ENERGY BRANCH

C. Ryan
Assistant Deputy Minister

Nova Scotia is heavily dependent on petroleum for its everyday needs. Approximately 65 per cent of its primary energy comes from petroleum, most of which is imported from foreign sources.

The provincial government has established a clear objective to reduce this dependence by developing Nova Scotia's indigenous energy resources; gaining access to Canada's energy resource base; and improving the efficiency of energy use.

The mandate of the Energy Branch is to initiate and implement policies and programs to achieve the government's energy goals. The Branch consists of two divisions — Energy Resources and Energy Management. The Energy Resources Division focuses on the development of Nova Scotia's indigenous resources, particularly offshore oil and gas, coal and peat. The Energy Management Division focuses on the acquisition of energy from outside the province and the utilization of energy within the province.

ENERGY RESOURCES DIVISION

A. G. Batcup, PEng, Director

INTRODUCTION

The Energy Resources Division is accountable for the effective evaluation, promotion and regulation of Nova Scotia's energy resources. The Division's activities are primarily concerned with the two main hydrocarbon resource sectors: petroleum (oil and gas) and coal. The location of the division's activities are shown on Figure 6.

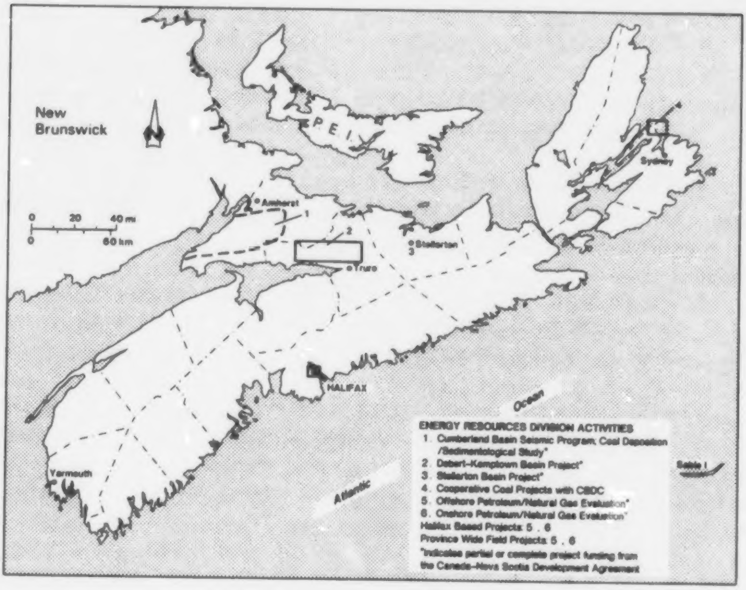

New Brunswick
P.E.I.
0 20 40 mi
0 60 km
Amherst
1
2
Truro
Stellarton
3
Sydney
4
HALIFAX
Yarmouth
Atlantic
Ocean
Sable I
ENERGY RESOURCES DIVISION ACTIVITIES
1. Cumberland Basin Seismic Program; Coal Deposition /Sedimentological Study*
2. Debert–Kemptown Basin Project*
3. Stellarton Basin Project*
4. Cooperative Coal Projects with CBDC
5. Offshore Petroleum/Natural Gas Evaluation*
6. Onshore Petroleum/Natural Gas Evaluation*
Halifax Based Projects: 5 . 6
Province Wide Field Projects: 5 . 6
*indicates partial or complete project funding from the Canada–Nova Scotia Development Agreement

FIGURE 6. Locations of Energy Resources Division projects

World oil prices impact the Division's activities directly in the case of petroleum exploration and development, and indirectly in the case of a competing fuel such as coal.

During the 1988-89 fiscal year, world oil prices fluctuated between US $20 per barrel and US $12 per barrel with some evidence of stabilization around US $18 per barrel at the end of the period.

The unpredictable price movements which characterized most of the year made it a difficult period for investments in energy projects by industry and governments. Nonetheless, several encouraging events occurred on the Nova Scotia energy scene which have positive implications for future development of the province's energy resources. Public interest in environmental issues was acknowledged in several policy decisions made by the governments of Nova Scotia and Canada in the energy sector during the year.

The year saw an upsurge of interest in Nova Scotia's coal resources which will carry over into 1989/90 and beyond. Evidence of this resurgence included:

- 1988 export sales of over 900 000 t by the Cape Breton Development Corporation (CBDC) to Brazil, Sweden, Japan and other Canadian provinces (1988 export tonnages represent an 82 per cent increase over 1987),

- the start of construction on a new, one million tonne per year underground mine by Westray Coal in Pictou County (over 200 new jobs will be created), and

- the signing of a $1 million, three year coal exploration agreement with Esso Resources for work in the Springhill area of Cumberland County.

The Division's coal geologists continued their co-operative studies with CBDC's geologists, assisted Westray personnel in their analysis of the Pictou Coalfield geology and were directly responsible for attracting Esso Resources to the Cumberland Basin coal deposits.

The Division is very conscious of the need to develop environmentally acceptable technologies which would open up new markets for our substantial coal resources. These technologies focus on alternative, coal-derived fuels and on cleaner ways of burning our reserves of higher sulphur coal. In 1988 the Government of Nova Scotia, in conjunction with the federal government, contributed funds towards the Minas Basin Coal Water Fuel Demonstration Project and towards the start of a feasibility study of a Coal-Oil Coprocessing Plant which would be located at Point Tupper. In addition, the Provincial Cabinet has decided to invest a further $250,000 a year in coal research and development starting in the 1989-90 budget year.

In a difficult year for petroleum exploration in Canada and elsewhere in the world, a single exploration well was drilled offshore

Nova Scotia: Mobil's B-44 South Sable well. For the first time since 1984, an onshore petroleum well was also completed: the Irving-Chevron Mull River #1 well which was drilled near Mabou on Cape Breton Island. The drilling of both wells was closely monitored by Petroleum Section staff.

The item on the offshore scene which produced the most headlines in the 1988-89 fiscal year was undoubtedly the Georges Bank drilling issue. The Government of Nova Scotia passed legislation in May 1988 which placed a moratorium on exploration drilling on Georges Bank until at least the year 2000, pending a detailed environmental and socio-economic review which will be held in the late 1990's. The moratorium acknowledges the importance which the government places on the Georges Bank fishery as the mainstay of the economy of southwestern Nova Scotia and as the foundation of the social and cultural heritage of that region. Staff were heavily involved in the events which led up to the passing of the legislation and in the drafting of the legislation itself.

The activities of Iona Resources and Nova Scotia Resources Limited (NSRL) in the 1988-89 fiscal year gave rise to optimism that development plans for the Cohasset and Panuke oilfields offshore would be forthcoming in the second half of 1989. These fields contain between 30 million and 40 million barrels of recoverable oil and, given oil prices in the U.S. $15 to $20 per barrel range, could be developed over a three year period using techniques proven in the North Sea. Although much smaller than the Venture Gas Project, this project would be invaluable in developing the capabilities of Nova Scotia suppliers and manufacturers, in diversifying our energy supply options, and in reducing our dependence on imported crude oil. Petroleum section staff held numerous discussions with Iona and NSRL during the 1988-89 fiscal year concerning their plans for development.

Petroleum Resources Section

C. Andrew Parker, PEng, Manager

INTRODUCTION

The Petroleum Resources Section is responsible for administrating all aspects of Nova Scotia's petroleum resources onshore Nova Scotia and, in conjunction with the Nova Scotia office of the Canada Oil and Gas Lands Administration (COGLA), offshore Nova Scotia. This work includes the development of policy, legislation and regulations; monitoring, regulating and evaluating the resource; advising provincial officials; and promoting the resource.

The 1988-89 fiscal year was a productive period although the level of exploration activity on the Scotian Shelf continued to be low. The Section's main activities included the following:

- regulations and policy were developed for the offshore as required for the implementation of the Accord legislation,
- evaluation of the small oilfields offshore Nova Scotia was undertaken to determine if development was feasible,
- a call for proposals for exploration rights on three parcels of offshore acreage was issued by the Canada-Nova Scotia Offshore Oil and Gas Board on the recommendation of the Section,
- a detailed technical publication to promote exploration offshore Nova Scotia was prepared in conjunction with COGLA,
- considerable analysis of various potential onshore and offshore fields was completed as part of the promotional effort,
- the successful drilling of the South Sable B-44 well by Mobil Oil was monitored which located additional gas reserves in the Sable Island,
- following a geological field program, Irving-Chevron completed the drilling of the Irving-Chevron Mull River #1 well in the Mabou, Cape Breton area, and
- rentals of $173,966 were received in respect of active onshore exploration agreements.

OFFSHORE EXPLORATION AND DEVELOPMENT

One of the highlights of the fiscal year 1988-89 proved to be the discovery of additional gas reserves south of Sable Island. Mobil drilled the South Sable B-44 well and successfully completed a production test. The well tested 21.4 MMCF/d (606 x 10^3m^3/d) of gas.

At the completion of the 1988-89 fiscal year a total of 177 914 ha was held under active exploration agreements (EAs). In addition to the active EAs, there are 98 109 ha held by industry under significant discoveries and 3.7 million ha of lands not currently open to exploration on Georges Bank and lands adjacent to St. Pierre and Miquelon. A summary of these lands is presented in Table 6 and Figure 7.

The Canada—Nova Scotia Offshore Oil and Gas Board declared the South Sable Field a Significant Discovery and amended the Thebaud Significant Discovery area.

Nova Scotia Resources Limited (NSRL), a provincial crown corporation, and a Nova Scotia based private company, Iona Resources, announced their interest in developing the Panuke and Cohasset oil fields. They each obtained options to purchase other companies' interests in the two fields and held discussions to determine the feasibility of a joint development. These fields could be in production by 1992.

ONSHORE EXPLORATION ACTIVITY

Throughout the drilling and upon completion of the Irving Chevron Mull River #1 well, the Section prepared and finalized the required inspections and approvals.

In July 1988, the Miles exploration agreement was cancelled. Three onshore exploration agreements remained active at the end of the fiscal year 1988—89 (Table 7 and Fig. 8).

A departmental drilling unit was used to drill a shallow exploratory hole on the east side of Lake Ainslie, Cape Breton. The purpose of drilling was to intersect a sandstone unit which contains oil, a sample of which was taken for laboratory analysis. A chromatographic profile, which helps identify the oil by its hydrocarbon components, was produced.

The Section also advised in the abandonment of the NSDME-1 Alton minerals drillhole which encountered gas.

On May 31, 1988, the Province entered into a Coal Gas Exploration Agreement with the Cape Breton Development Corporation (CBDC) covering 74,560 hectares (Table 2). The CBDC is currently venting 2.0 million CFD of coal gas from the Lingan

TABLE 6. Offshore land summary at the end of the 1988-89 fiscal year

Exploration Agreements (EAs)
(excluding SDAs)

	EA Number	Description	Area (Acres)	(Hectares)
Bow Valley Industries	235		95,775	38,760
Shell	298	Uniacke	3,637	1,472
Shell	299	Glenelg	227,742	92,166
Petro-Canada	300	Panuke	22,992	9,305
Canterra	350	Whycocomagh	89,477	36,211
Subtotal			439,623	177,914
Declared Significant Discovery Areas (SDA)				
1.		Cohasset	3,676	1,488
2.		Thebaud	16,545	6,696
3.		Onondaga	13,825	5,595
4.		West Sable	5,500	2,226
5.		Intrepid	14,707	5,952
6.		Olympia	8,250	3,339
7.		South Venture	15,584	6,307
8.		Venture	25,668	10,388
9.		Arcadia	16,471	6,666
10.		Citnalta	10,971	4,440
11.		West Venture C-62	6,417	2,597
12.		West Venture N-91	3,666	1,484
13.		Primrose	6,417	2,597
14.		Banquereau	11,885	4,810
15.		Alma	21,233	8,593
16.		West Olympia	9,167	3,710
17.		North Triumph	19,355	7,833
18.		Chebucto	18,433	7,460
19.		Uniacke	10,971	4,440
20.		South Sable	3,676	1,488
Subtotal			242,417	98,109
Exploration Permits not currently open to exploration - Georges Bank and St. Pierre and Miquelon Boundary Areas			8,648,500	3,500,000
TOTAL			9,330,540	3,776,023

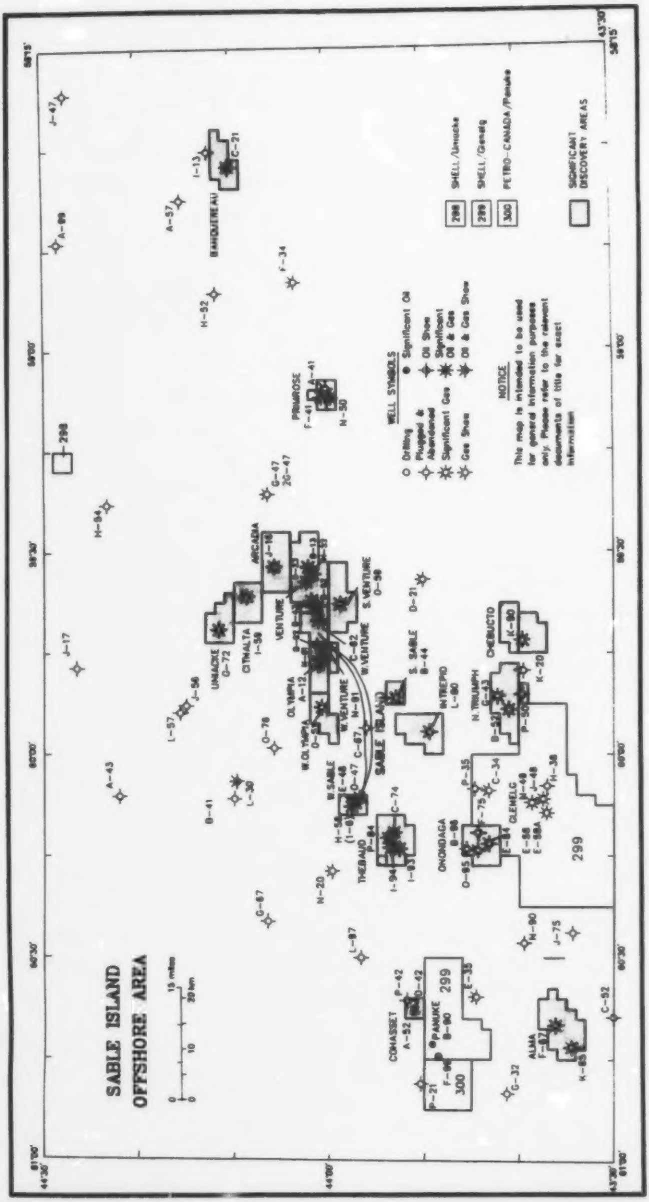

SABLE ISLAND OFFSHORE AREA
0 10 20 km
10 miles
WELL SYMBOLS
Drilling
Plugged & Abandoned
Significant Gas
Gas Show
Significant Oil
Oil Show
Significant Oil & Gas
Oil & Gas Show
NOTICE
This map is intended to be used for general information purposes only. Please refer to the relevant documents of title for exact information
298 SHELL/Uniacke
299 SHELL/Genelg
300 PETRO-CANADA/Panuke
SIGNIFICANT DISCOVERY AREAS
BANQUEREAU
PRIMROSE
UNIACKE G-72
CITNALTA I-59
ARCADIA J-16
VENTURE
OLYMPIA A-12
W.OLYMPIA O-51
W.VENTURE N-91
S.VENTURE O-59
W.SABLE
SABLE ISLAND
S.SABLE B-44
INTREPID L-80
N.TRIUMPH G-43
CHEBUCTO K-90
THEBAUD P-84
ONONDAGA
GLENELG
ALMA F-67
COHASSET A-52
PANUKE B-90
298
299
299
300

FIGURE 7. Offshore exploration agreement locations

TABLE 7. Summary of onshore oil, natural gas and coal gas rights holders

Licensee	Negotiated Area (acres)	(hectares)	No. of EAs Negotiated	Rentals Paid
Chevron Canada Resources Ltd.				
Cape Breton	1,469,743	594 805	2	$ 71,376.60
Cumberland	2,066,382	836 265		$100,351.80
Consultants A.G.R.E.N. Canada Inc.	46,780	18 648	1	2,237.76
Total	3,582,905	1 449 718	3	$173,966.16

Onshore Coal Gas

Licensee	Negotiated Area (acres)	(hectares)	No. of EAs Negotiated	Rentals Paid
Cape Breton Development Corporation (CBDC)	184,235	74 560	1	$8,947.20

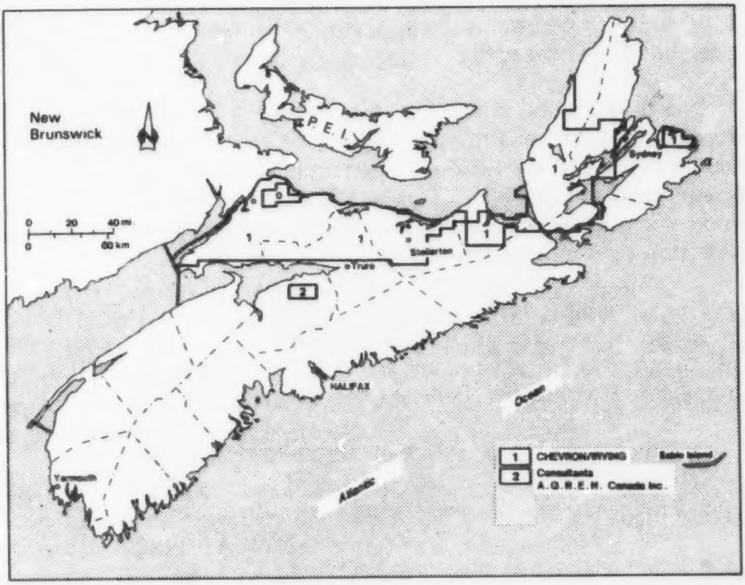

New Brunswick
P.E.I.
0 20 40 mi.
0 60 km
1
1
1
1
Stellarton
Truro
2
Sydney
HALIFAX
Yarmouth
Ocean
Atlantic
1 CHEVRON/IRVING
2 Consultants A.G.R.E.H. Canada Inc.
Sable Island

FIGURE 8. Onshore exploration agreement locations

mine. The Coal Gas Agreement provides for CBDC to begin using the coal gas as a fuel to generate electricity within the three year term of the agreement.

OTHER RELATED SECTION ACTIVITIES

The Section prepared, in conjunction with staff from COGLA, a publication called Petroleum Opportunities Offshore Nova Scotia, Canada. This publication is expected to be published and distributed in May 1989. It contains detailed geological and geophysical information on Nova Scotia's offshore Region and is designed to acquaint oil and gas exploration managers worldwide with Nova Scotia's exploration opportunities.

An onshore source rock study initiated by the Section under the Federal-Provincial Mineral Development Agreement (MDA) continued during the 1988—89 fiscal year. Data obtained has been processed. A number of new insights, interpretations and discoveries will be highlighted in the final report scheduled to be published during the next fiscal year.

Due to increased interest in seismic information within the last few years, a report on Reflection Seismic Coverage of Onshore and Nearshore Nova Scotia 1942–1987 was published and distributed by the Section this fiscal year. This report presents a summary of past seismic projects within the Province and is designed to encourage exploration activity.

The Section produced the eighth annual publication **Oil and Gas Exploration in Nova Scotia.** It has also compiled a variety of maps and display materials for various oil and gas trade shows as well as the Department of Mines and Energy Open House.

Staff continued to be active on the following committees:

- Environmental Co-ordinating Committee
- Sable Island Environmental Advisory Committee
- Canadian Standards Association (CSA) Steering Committee for Offshore Structures
- CSA Government and Regulatory Authorities Committee
- Joint Land Management Committee
- Geophysical Regulations Committee
- Oil and Gas Occupational Safety and Health Regulations Committee
- Frontier Geoscience Committee
- Production and Conservation Regulations Committee
- Production and Conservation Regulations Committee
- Canada Oil and Gas Drilling Regulations Committee
- 1988 Core Conference Committee.

Coal Section

C. E. Bain, PEng, Manager

INTRODUCTION

The Coal Section of the Energy Resources Division comprises two groups: Coal Exploration and Coal Development.

The mission of the Coal Exploration group is to assess the coalfields of Nova Scotia to determine the availability, quantity and quality of underground and surface deposits of coal. This group collects and analyzes field program data and provides technical assistance in coal exploration and development matters to industry and to other government departments.

The mission of the Coal Development Group is to encourage and coordinate the development and efficient use of coal and coal products. Specific activities within this mandate include:

- monitoring demand for coal within the Province,
- encouraging its use as a substitute for imported fuels,
- monitoring Canadian and international developments in coal conversion and utilization technologies and determining their relevance to Nova Scotia,
- monitoring and assessing coal supply to identify new coal mining opportunities,
- assessing proposals for private sector coal exploration programs, and
- preparing coal and peat development and utilization policies.

In summary, the role of the Coal Section is to explore, evaluate and promote the development and use of the coal resources within the Province.

DEVELOPMENT AND UTILIZATION

The future of coal, which is one of the Province's most important resources, will depend on the development of new technologies for using coal and on the implementation of optimum mining, processing, handling and transportation systems. The Coal Section monitors research and development activity related to coal utilization to evaluate its application to the Nova Scotian coal industry. The Section is involved in various research and development projects within the Province including coal beneficiation, coal gasification, fluidized bed combustion, coal liquid mixtures, coal liquefaction, and coal/oil co-processing, for example.

On an ongoing basis, the Coal Section analyzes barriers to expanded coal utilization and directs research toward solving them. Coal transportation, blending facilities, optimum use of existing infrastructure, cost-effective means of reducing combustion emissions and market competition with alternate fuels are just a few of the issues being addressed by the Department.

Committee on Atlantic Coal (CAC)

The Committee on Atlantic Coal (CAC), established in 1982, brings expertise from the scientific community in the Atlantic Provinces to bear on specific problems related to the mining and utilization of coal and facilitates communications between the industry and the research and development community.

The Coal Section solicits funding for coal research and development (R & D) and coordinates the CAC R & D program. The Cape Breton Development Corporation has committed $250,000 to the CAC R & D program in the 1987-88 and 1988-89 fiscal years with matching funds from Energy, Mines and Resources Canada (EMR). Similar commitments have been repeated for 1989/90 and, in addition, the Nova Scotia Department of Mines and Energy is contributing $250,000. Projects funded in 1988 related to resource assessment, underground mining, health and safety, and coal utilization.

Coal Research, Development and Demonstration

The Coal Section continued its involvement in coal research, development and demonstration during 1988 with projects to:

- develop a direct liquefaction process for Nova Scotia coals that can sustain high liquid yields of good quality products,
- assess the feasibility of coprocessing Nova Scotia coal and heavy oil/oil residium to transportation fuel feedstock,

- demonstrate the feasibility of coal water fuels for industrial users,
- assess the feasibility of using a commercial sized circulating fluidized bed unit with Nova Scotia coal, and
- evaluate coal gasification technologies and their application with Nova Scotia coals for power generation and/or chemical feedstock production.

Coal Liquefaction. The Department of Mines and Energy continued to fund the coal liquefaction research program at the Nova Scotia Research Foundation Corporation (NSRFC) laboratories in conjunction with EMR. Extensive test work on two-stage direct liquefaction continued in 1988 at NSRFC with the objective of developing a process suitable for Nova Scotia coals that can sustain high liquid yields. This investigation has been complemented by two longer tests (20-day continuous runs) funded by the Oil Substitution Agreement. The last run demonstrated smooth operation with no process related problems. Product yields and recycle liquid properties were remarkably stable relative to earlier liquefaction tests with Nova Scotia coals.

Co-processing. Scotia Synfuels, with cofunding from Petro-Canada and Government, initiated a project in December 1988 to evaluate the technical and economic feasibility of a possible commercial venture at Point Tupper for the coprocessing of Nova Scotia coal and heavy oil or refinery residium to produce liquid transportation fuels. Using Hydrocarbon Research Incorporated coal/oil coprocessing technology, process conditions (severity and coal loading) were tested followed by 15 days of continuous operation at constant operating conditions with no process related problems. Preliminary engineering and an economic assessment will follow the test work.

Coal Water Fuels. With funding from the Oil Substitution Agreement a boiler at the Minas Basin Pulp and Power Co. Ltd. in Hantsport was converted to burn coal water fuel (CWF). This boiler, in combination with the company's existing waste wood-fired boilers, has the capability of providing all their process steam requirements from indigenous fuels. During the demonstration, the boiler will be available for inspection by industries interested in diversifying their energy supply. Approximately one year of the scheduled two-year trial with coal water fuel has been completed.

A further study was undertaken to characterize the ash from CWF combustion and to investigate suitable methods for particulate control.

Fluidized Bed Combustion. The Nova Scotia Power Corporation conducted a study funded under the Oil Substitution Agreement to determine whether Nova Scotia coals can be economically utilized in a 150 MW, commercial scale, circulating fluidized bed (CFB) unit. A 6500 t test burn of Prince coal at the Chatham CFB test facility followed this study. Several Nova Scotia limestones were used for sulfur capture during the very successful test burn. Additional work focussed on the erosion characteristics of fluidized bed ash.

Coal Gasification. Because of its ability to meet stringent environmental restrictions and its potential for high efficiency, coal gasification technology for electricity generation or the co-production of chemical feedstocks is commanding widespread interest. The Atlantic Coal Institute has carried out a study for Nova Scotia that:

- reviews and assesses gasification processes,
- characterizes Nova Scotia coals,
- evaluates the economics and environmental performance of coal gasification, and
- selects the most appropriate Nova Scotia coal(s) for gasification along with the most suitable process(es).

As a continuation of this work two additional projects have been initiated:

- computer simulation of process performance by key coal gasification process developers with three Nova Scotia coals, and
- a site specific (Point Aconi) engineering and economic assessment of integrated gasification combined cycle (IGCC) power generation (part of a consortium project sponsored by the Canadian Electrical Association that investigates IGCC for three Canadian sites).

The Department also funded a study by British Sulfur that assessed the potential for producing and marketing ammonia and urea from Nova Scotia coal.

Oil Substitution and Conservation

The Canada—Nova Scotia Oil Substitution and Conservation Agreement was initiated in 1977 to reduce Nova Scotia's dependence on imported oil through conservation and displacement by coal or renewable resources. The program was scheduled to be completed by March 1987, but was extended until March 1989 to allow completion of approved projects. The Coal Section administered the day-to-day details of the program.

Coal projects related to fluidized bed combustion, coal gasification, coal liquefaction and coal water fuels were funded under this program in 1988/89. Further information on these projects can be found in other sections of this report.

A report on future potential oil substitution projects in Nova Scotia was also prepared by a consultant.

Coal Resources

In the 1988-89 fiscal year, the Coal Resources Section continued to evaluate the provincial coal resource potential and to monitor activities of companies engaged in coal mining and exploration. Two projects involving other government agencies were also conducted. The first was the Coal Geology Database, a project funded under the Canada—Nova Scotia Mineral Development Agreement, and the second, a co-operative study between the Department and the CBDC on sulphur distribution in the coals of the Sydney coalfield relative to types of roof cover.

Coal Geology Database

Construction of a comprehensive computer data base of geological and coal analytical data for the Nova Scotia coalfields continued for a fourth year. This project is implemented by the Geological Survey of Canada (GSC) - Institute of Sedimentary and Petroleum Geology in co-operation with the Department.

Compilation, interpretation, coding, data entry and verification of location, lithology and coal quality information from boreholes, outcrops and mine workings are performed by contract personnel utilizing the GSC's computer in Calgary via dedicated line and on-site terminal in Halifax.

In fiscal year 1988-89, data entry continued for the Pictou coalfield. Miscellaneous entry and verification continued for other Nova Scotia coalfields. To date, 1340 boreholes with an aggregate footage of 158 340 m (519,500 feet) have been entered. Analytical data includes 1905 samples from boreholes and some 3500 channel samples from underground mines.

Preliminary work began late in the year on generating a computer model of the Sydney coalfield. Such a model can serve to clarify the geometry and distribution of lithologic units (e.g. coal seams) within the coalfield and determine coal resource quantity and quality. The completed model will be of considerable benefit in coal resource evaluation, mine planning, and interpretations of depositional conditions.

COAL GEOLOGY

Geological investigations continued in the Sydney, Pictou, Cumberland and Debert-Kemptown Basins.

In the Sydney coalfield, work began on a co-operative study with the Cape Breton Development Corporation (CBDC) Geology Department of the relationship of lacustrine roof strata of economic coal seams to the distribution and character of sulphur in the underlying coal. Activity has focussed on the Harbour Seam in the Donkin Resource Block, a future resource which was outlined by offshore drilling in the late 1970s.

The geological investigation has been designed with several goals in mind:

- to develop an understanding of the stratigraphy, sedimentology, and, therefore, the depositional system responsible for the coal and its cover rocks,

- the need to establish some baseline data on the relationship between lithostratigraphy, geochemistry, and organic petrography of such deposits in the Sydney coalfield, and

- ultimately, to establish some criteria, if possible, for identifying and predicting the effects of lacustrine roof strata on such critical resource parameters as coal quality and seam thickness.

Initially, work has concentrated on relogging of selected core intervals typifying both lacustrine and non-lacustrine roof types.

Sampling and analysis of both coal and roof strata (sulphur chemistry, major and trace elements) are underway. Integration of these data should provide the basis for some preliminary conclusions on the relationship between lacustrine strata and high sulphur coals, particularly the character and mode of occurrence of the sulphur and any associations of trace elements or lithotypes. It should also provide the kind of baseline data with which to extend and focus further research on the problem in the Sydney coalfield and other coalfields in the Province.

Further work has been done on the palynology of the Sydney coalfield in cooperation with Mineral Resources Division and M. R. Gibling, Dalhousie University. Results have served to refine age relationships within the recently defined coal-bearing Sydney Mines Formation and the South Bar Formation of the Morien Group. As well, the setting of the Sydney coal zones within the Maritimes Basin will be clarified.

Pictou Coalfield

In the Pictou coalfield (Stellarton Basin) structural patterns were studied to delineate fault trends in the basin. In addition, the western half of the basin was mapped and a geological map of the area prepared.

The study of structural patterns incorporated information on faults measured from past mining operations, drillhole information, regional mapping, seismic surveys and in part aeromagnetic surveys. The information shows that observable fold and fault directions are compatible with those found in theoretical models and with observations in present day fault zones.

The predictable nature of the faulting in the coalfield and its influence on sedimentation, especially with regard to coal deposition will prove useful as the workings of the Westray Mine on the Foord seam advance.

During the 1988 field season, all of the exposure within the 40 km^2 west half of the Stellarton Basin was mapped. The data from this mapping project has been used to prepare a geological map of the area (NSDME OFM89-017) which adjoins that covered by a map of the east half of the basin (NSDME OFM86-047). The final version of the geological map is in preparation and will be released early in the 1989-90 fiscal year.

The information obtained from this and earlier mapping has been used to prepare a paper which discusses the stratigraphy, sedimentology, depositinal environments and controls on coal formation in the Stellarton Basin. The paper has been published in the GSC publication Recent Contributions for Coal Geoscience in Canada (GSC Paper 89-8).

The McLeod coal seam has continued to be a focus of interest as it represents a resource which could potentially be accessed by a planned mine on the Foord seam. During 1988, a number of reports on various aspects of the geology of the McLeod coal seam (stratigraphy, organic petrography, resource estimates) were published in the NSDME Report of Activities and submitted to the journal Maritime Sediments and Atlantic Geology. A comprehensive report on the factors which controlled formation of the McLeod seam is in preparation.

In 1988, the Drummond Mine Project, operated by Pioneer Coal Company Limited completed the extraction of coal pillars on the Acadia seam in Westville. This project was an open pit operation that started in 1984 and ended in the second half of 1988 having produced approximately 473,000 tonnes of coal. A washplant was erected in 1988 and the reclamation of the old coal dumps from the defunct Drummond Colliery and the Acadia No. 5 Mine in the town of Westville began. Exploration for additional coal resources from the Acadia seam was also carried by Pioneer Coal with the drilling of 11 drillholes.

Site preparations began in 1988 for a new underground coal mine at Plymouth. The mine will be operated by Westray Coal Incorporated and plans are to mine the Foord seam to the east of of the old workings mined from the Allan shaft. The Allan shaft closed in 1951. Tonnage is expected to be 1 million tonnes/year with production to begin in late 1991.

Cumberland Basin

A major coal exploration initiative was undertaken by the Coal Section and Drilling Division of the Department during the period February 1988 - March 1989 at South Athol, Cumberland County. The choice of the site, 12 km west of the Springhill coalfield, was based on three key points:

- the existence of a potentially coal-bearing seismic reflector which can be correlated with the coal-bearing sequences of the Springhill and Joggins-Chignecto coalfields,

- depth constraints imposed by diamond-drilling and mining, and
- potentially favourable conditions for coal formation, based on the extrapolation of studies conducted in the Springhill coalfield.

The first drillhole, SA.88.1, was terminated at a depth of 862 m due to adverse drilling conditions including caving of the hole. A second attempt, SA.88.2, incorporated design changes in an effort to avoid technical difficulties experienced in SA.88.1. This second drillhole was successful in reaching the target zone as indicated on the Geological Survey of Canada seismic profile; drilling was terminated at a depth of 1156 m, near the capacity of the drill in such strata.

The coal-bearing sequence comprising grey, multi-storied sandstones, grey and mottled mudrocks and coal seams up to 0.6 m thick was intersected in the lower 21 m of the hole. Seismic correlation indicates that these seams are the approximate stratigraphic equivalent of the upper, thick coals of the Springhill coalfield, in the vicinity of the Rodney seam. This correlation is pending corroboration by miospore analyses. By comparison with the areal distribution of coals at Springhill, the seams intersected in SA.88.2 could thicken to 2 m or greater in as little as 1 km to the north.

The intersection of this coal-bearing sequence at South Athol confirms the coal-bearing aspect of the seismic reflector which can be traced throughout the Athol syncline of the Cumberland Basin. The intersection of coal-bearing strata 12 km west of the Springhill coalfield has major implications for vast, albeit deep, coal resources in the central Cumberland Basin; these resources may be an order of magnitude larger than presently estimated (10^9 vs 10^6 tonnes).

Esso Resources Canada announced a three year, $1 million dollar exploration programme for coal within the Cumberland Basin. Work on the programme will begin early in the 1989-90 fiscal year.

Debert-Kemptown

Regional 1:10 00 scale mapping of the Debert-Kemptown Basin began in 1988 as part of a long term evaluation of its coal resource potential. Approximately half of the basin was mapped during 1988; however structural complexities in some areas will require further study. The

1:10 000 scale mapping has indicated the structure of the basin is more complex than previously suspected. This is suggested by abrupt changes in bedding attitudes, difficulty in correlating lithological units laterally, and the high frequency of closely spaced fractures and slickensided surfaces. Developing an improved structural and stratigraphic framework for the basin will remain the highest priority of the mapping program.

In addition to the mapping program, petrographic analysis of the coals and a regional palynological study was begun. Initial study of the organic petrography of the coals has been confined to determining regional variations in coal rank. Preliminary results confirm the observations of earlier studies: that a pronounced change in coal rank occurs between the Debert River area in the northeast (Ro.85) and the Kemptown area in the west (Ro.2.2). Maceral analyses of some coals have also begun and this study will be expanded next year. Preliminary palynological analyses of the coals and mudrocks undertaken as part of this study have been somewhat disappointing. Spore recoveries from the coals have been particularly poor. This implies however that they may be age equivalent to the Westphalian A-B coals of the Cumberland Basin which also typically have poor spore recoveries. The coal-bearing strata of the basin has been previously assigned a Westphalian B-C age.

Oil Shale Resources Project

The aim of this project has been to obtain information on the geology, hydrocarbon yield and composition of provincial oil shale resources in order to aid in assessment of their utilization potential. In all, 12 areas reported to contain oil shales were investigated. Of the 12 areas investigated, oil shales at Stellarton and Antigonish comprise the largest resources - 825 x 10^6 t of oil shale/168 x 10^6 barrels of shale oil *in situ* at Stellarton and 738 x 10^6 t of oil shale/75.6 x 10^6 barrels of shale oil *in situ* at Antigonish.

All data, including historical information, on the 12 areas has been compiled for presentation as a final project report. The report entitled Oil Shale Resources of Nova Scotia was completed at the end of the 1988-89 fiscal year and will be submitted for release as a NSDME Bulletin early in the 1989-90 fiscal year.

In addition to the final project report, a paper entitled Oil Shales of the Stellarton Basin, Nova Scotia, Canada: Stratigraphy, depositional environment and potential uses has been submitted for presentation at the 22nd Annual Oil Shale Symposium in Colorado. The paper will be presented early in the 1989-90 fiscal year at the symposium with the paper printed in the symposium proceedings which receive international distribution. An additional paper has also been prepared; the paper is on the highest grade oil shales (stellarites or boghead shales: max. 250 l/t) of the Stellarton Basin. A study of new techniques for macroscopic, microscopic, and geochemical analysis of these oil shales has been submitted to the journal Fuel.

Future oil shale work is planned as a three year project to follow-up the results obtained from this project. A study to investigate the utilization potential of one or more of the attractive oil shale beds in Stellarton has been proposed for funding under a new Canada—Nova Scotia Mineral Development Agreement. The study would investigate the potential for a multiple-use of the oil shale such as pyrolysis followed by combustion for electric power generation, and co-combustion with coal with the ash residue utilized as a concrete additive.

ENERGY MANAGEMENT DIVISION

Director, Greg Haverstock, PEng

INTRODUCTION

The Energy Management Division has three primary responsibilities:

- to evaluate, analyze, and contribute to policies and technologies affecting energy supply and demand,
- to implement energy efficiency and conservation programs, fuel substitution programs, and renewable and indigenous energy resource programs, and
- to provide programs that increase public awareness of energy conservation, energy supply options, provincial energy policies, plans and programs.

ORGANIZATION

The division is composed of two sections: Energy Programs and Energy Engineering. The Energy Programs Section includes: the Provincial Energy Analysis Program, which delivers energy analysis and follow-up programs to the public and industrial/commercial sectors; Residential Energy Programs, which provides energy conservation services and project management to the residential and transportation sectors; and the Energy Education Program, which provides educational information on energy to students and educators. The Energy Engineering Section plans, implements and evaluates technical studies and energy conservation and renewable energy projects.

ACTIVITIES

The Canada—Nova Scotia Memorandum of Understanding on Conservation and Alternative Energy (MOU) concluded its wind-down year on March 31, 1989, ending three years of jointly funded energy projects in all sectors of the economy. Negotiations were initiated with Energy, Mines and Resources Canada on a Letter of Understanding (LOU) under the federal Energy Efficiency and Diversity Initiative to replace the MOU.

In the renewable energy sector, two major studies of wood energy were completed under the MOU in fiscal year 1988/89. The studies examined the use of wood energy for district heating and the technical and economic considerations of small scale wood chip harvesting operations.

Industrial/commercial sector MOU projects included a study of energy production from fish waste and an evaluation of waste heat recovery from a computer room.

MOU projects in the residential sector included the Interior Moisture Project, a study of moisture problems in single family dwellings in Nova Scotia, and the Municipal Air Seal Project, a project to reduce heating costs for low income homeowners in Cape Breton County.

MOU projects completed during fiscal year 1988/89 in the transportation sector included Pro-Trucker and Pro-Fisher which provided information on fuel efficiency to the commercial trucking and inshore fishing industries respectively.

Significant activities were directed at the residential oil heating industry using funds provided by the Canada-Nova Scotia Oil Substitution and Conservation Agreement. Activities included seminars for service personnel, a conference on industry developments and a financial assistance program for the purchase of combustion test equipment.

In consultation with other provincial departments, Energy Programs staff developed an Internal Energy Management Policy for reducing energy costs in public buildings. This was approved by the Executive Council in January 1989.

A proposal for an Economic and Regional Development Sub-agreement on biomass was prepared for submission to the federal government.

Staff also developed a new program — The Wood Energy Feasibility Analysis Program — to provide financial assistance for engineering feasibility studies and thereby reduce the financial risk to organizations considering the use of wood as an energy source.

The Provincial Energy Analysis Program (PEAP) performed energy analyses on 112 buildings in fiscal year 1988/89, identifying potential energy savings averaging 12.4 per cent.

PEAP staff also developed an energy accounting system for monitoring energy use and costs at public buildings and arranged courses on energy management and maintenance and operation of building systems for operators and maintenance staff of public facilities.

Staff of the Energy Programs and Energy Engineering Sections developed a new energy analysis program for large industrial and commercial users to be offered in fiscal year 1989/90.

Staff continued to provide information concerning energy efficiency to owners of new and existing homes. Just under three thousand enquiries were received on the department's toll-free Enerinfo line and as a result of the department's presence at home and energy shows across the province.

Division staff also represented the Department on a number of local, national and international committees dealing with energy issues of concern to the Province.

ENERGY AWARDS

The Division once again sponsored the Nova Scotia Energy Awards for outstanding contributions to energy management or fuel substitution. The following is a list of 1988 Award winners:

1. *Business and Commerce*

   Hometite Services Ltd., Halifax
   - This company has been active in energy conservation for the past ten years, specializing in airsealing and residential ventilation systems. The award was presented for the company's commitment to quality materials and workmanship, investment in training, and its ability to keep abreast of new technology.

2. *Governments and Institutions*

   Annapolis District School Board, Annapolis Royal
   - From 1985 to 1987, this school board reduced its annual heating costs by 30% or nearly $130,000 through education of maintenance personnel, conscientious employees, installation of heating control systems, and improved maintenance of all systems.

Fortress of Louisbourg National Park, Louisbourg

- From 1981 to 1987, this facility reduced its energy costs by 24% by improving the efficiency of oil-fired heating systems in 57 buildings and with the complete cooperation of staff.

Controltek Environment Services and Guysborough District School Board, Guysborough

- Utilizing a cost-sharing agreement with Controltek Environmental Services, an energy engineering and energy service firm, this school board was able to achieve substantial savings in energy cost and reduce energy use in its fourteen buildings.

St. Rita Hospital, Sydney

- The hospital, following recommendations made by the Nova Scotia Association of Health Organizations, reduced their oil and electricity use for an annual savings of $33,283. This was accomplished by adding night setback controls, turning off air handling systems when not required, adding insulation to pipes and storage tanks, and air sealing.

3. *Organizations, Community Groups and Individuals*

Mr. Peter Beaini, Bedford

- Mr Beaini designed and manufactures a device that reduces the energy required to produce domestic hot water for major users such as motels and institutions. Typical payback on this device is reported to be less than eighteen months.

Dr. Margaret Bateman Ellison, Halifax

- Dr. Ellison, a professor at Mount Saint Vincent University, has been active in the development of a Hospitality Training Program which includes energy management. As Chairman of the Hospitality Industry Energy Management Task Force, she hosted eight hours of DUET (Distant University Education Television) on energy management practices for the hospitality industry.

4. *Alternative Energy*

Sisters of Charity of St. Vincent de Paul, Halifax

- Mount Saint Vincent Motherhouse has implemented several projects over the last three years that have conserved large amounts of energy and utilized renewable energy sources. Two examples of these projects are: a) installation of a system to regulate domestic hot water temperatures to suit demand - producing savings of $21,000/year, and b) installation of a large solar domestic hot water heating system - reducing energy costs by $22,000/year.

Energy Award 1988 Honourable Mentions wereawarded to Soldiers Memorial Hospital, Middleton; R-2000 Home Tour, Halifax-Dartmouth; Mr. Phil Thompson, Halifax; Technical University of Nova Scotia Fuelathon Team, Halifax; and Black River Hydro Ltd., located in Melford, Guysborough County.

Energy Engineering Section

A. Parker, Manager

INTRODUCTION

The Energy Engineering Section is responsible for the planning, management, implementation and evaluation of studies and projects related to energy management, fuel utilization and substitution, energy transmission and distribution and renewable energy resources. The Section also provides engineering assistance on work being carried out by the Energy Programs Section and participates in long range planning and policy development.

ACTIVITIES

Much work during fiscal year 1988/89 was devoted to activities under the final year of the Canada/Nova Scotia Memorandum of Understanding on Conservation and Alternative Energy (MOU). Staff participated on three MOU sub-committees and acted as co-chairmen of the Renewables and Industrial/Commercial sub-committees.

Projects completed in the renewable energy sector included:

- studies of wood fired hot water district heating and small scale woodchip harvesting,
- information transfer activities such as a workshop for the managers/operators of wood energy heating plants, a series of passive solar construction courses, a display at the Nova Scotia Forestry Exhibition, and

- well drilling for a geothermal energy demonstration project at Surrette Battery Co. Ltd. in Springhill. This project will use heat pumps to extract heat from the minewater in the town's abandoned coal mines.

Projects completed in the industrial/commercial energy sector included: a feasibility study of applying high rate anaerobic treatment to liquid fish waste at Fish Reduction Ltd., Port Clyde, and monitoring and evaluation of a computer room waste heat recovery demonstration project at the Nova Scotia College of Geographic Sciences, Lawrencetown.

Staff were involved in the following projects:

- investigating the potential feasibility of applying ground source heat pumps in Nova Scotia,

- assisting Energy, Mines and Resources Canada with the development and implementation of an electric variable frequency drive demonstration at Crossley Karasten Carpets Ltd., Truro,

- assisting Provincial Energy Analysis Program (PEAP) staff with the development and implementation of a heat pump monitoring project at the University College of Cape Breton, Sydney, and

- providing assistance to the Economics and Statistics Division for an energy end use survey of selected Nova Scotia industries.

Energy Engineering and PEAP staff also conducted detailed energy audits at the following Nova Scotia industrial sites: Scotian Gold Co-operative, Coldbrook, Starr Manufacturing Ltd., Dartmouth, Galvantic Industries Ltd., Dartmouth, and Peninsula Farms Ltd., Lunenburg.

Staff have also provided support for initiatives in the residential sector. These have included:

- participation in a project to demonstrate methods to reduce interior moisture levels in five homes,

- contributing material for the Energy Adviser, a quarterly technical bulletin published by the Department, and

- staffing assistance at displays at home shows in Halifax.

Staff also prepared a proposal to the federal government for a Biomass Economic and Regional Development Sub-agreement (ERDA). The proposed ERDA highlights the economic development and job creation potential of wood energy. It would provide support for information transfer activities, demonstration of promising equipment and technologies, research and feasibility studies as well as financial incentives to make wood energy conversions more attractive.

The Wood Energy Feasibility Analysis Program was also initiated to reduce the financial risk to organizations considering wood as a source of energy. This program will pay 75 per cent (up to $7,500) of the cost of an approved engineering study of the feasibility of wood energy use at specific sites.

Staff continue to monitor technology developments which could affect energy production and use in Nova Scotia. Specific topics of interest included biomass and coal combustion systems, solar domestic hot water heaters, photovoltaic and wind energy systems and ground source heat pumps.

Energy Programs Section

J. Gordon, Manager

INTRODUCTION

The goal of the Energy Programs Section is to promote the efficient and appropriate use of energy within the province. This is achieved through the provision of various conservation and fuel substitution programs to all sectors.

Three main working groups comprise the Section: the Provincial Energy Analysis Program (PEAP), Residential Energy Programs, and the Energy Education Program.

PEAP provides on-site energy analyses to provincial and municipal government facilities. The program provides follow-up technical advice on the implementation of energy management measures recommended by these analyses. Upon request, PEAP also provides preliminary investigation of retrofit opportunities for small industries and commercial facilities.

Residential Energy Programs provides information and motivational programs on residential and transportation energy use. This group is responsible for monitoring and addressing significant residential and transportation energy conservation issues. The group also organizes the Nova Scotia Energy Awards.

The Energy Education Program carries out a variety of educational and outreach activities, often in co-operation with other departments, groups or associations.

RESIDENTIAL ENERGY PROGRAMS

Each year the Residential Energy Programs group receives thousands of requests from the public for advice and information. The Enerinfo phone line (1-424-5727), a province-wide, toll free advisory service, accounted for 1915 information requests during the fiscal year. Almost 1000 additional information requests were filled as a result of enquiries received by staff working at the Enerinfo display in home and energy trade shows. Information provided ranged from general to detailed, and covered such topics as insulation, ventilation and moisture problems, heating systems, air sealing, new home construction and vehicle fuel economy.

Staff responded to requests for site inspections of buildings and heating systems where major problems were being experienced. There were 35 inspections conducted followed up by staff recommendations to building owners during the fiscal year. A staff member provided expert advice on conservation on eight editions of Maritime Noon, a CBC phone-in program. General information on residential conservation was provided for media use.

Publications produced in the 1988-89 fiscal year included a new brochure on draftproofing, *Sealing, Weatherstripping and Caulking*; a new booklet on furnace servicing, *Oil Heating in the Home*; and a revised edition of the *Home Heating Workbook*.

Staff assisted with the formation of a local chapter of the Canadian Wood Energy Institute (CWEI) and the offering of courses by CWEI on inspecting and installing wood heating equipment. Residential Energy Programs also provided advice on energy efficiency improvements to other government departments and agencies.

The department also completed a number of initiatives to encourage proper servicing of oil fired residential heating equipment. Two-day seminars on servicing held in Sydney, New Glasgow, Yarmouth, and Halifax attracted more than 200 industry representatives in April and May of 1988.

A one-day conference in Halifax, Advances in Residential Oil Heating, in January 1989 was attended by more than 100 people. These sessions were funded under the Canada/Nova Scotia Agreement on Oil Substitution and Conservation.

As part of this residential oil heating initiative, assistance was offered to oil heating service companies towards the purchase of combustion efficiency test kits. A total of 38 kits were purchased and $12,815 in funding was provided.

During the 1988-89 fiscal year, staff completed energy related programs and activities under the (MOU) through the Transportation, Existing Housing and Communications Sub-Committees.

MOU initiatives included the *Energy Adviser*, a 16 page technical bulletin distributed to 1500 renovators, energy contractors, suppliers and government officials, which was published four times in the 1988-89 fiscal year.

A draft final report on the Interior Moisture Project, also funded jointly under the MOU, was completed and presentations on the project were made to the National Technical Committee of the Canadian Home Builders Association (CHBA) and to the Nova Scotia Chapter of CHBA.

Ventilation systems were installed in five of the 94 homes inspected as part of the Interior Moisture Project. Monitoring of homeowner satisfaction and action on the recommendations contained in the reports on the homes inspected is continuing.

The Municipal Air Sealing Project, a joint venture with Cape Breton County municipalities and the Canada Employment and Immigration Commission to air seal 90 homes owned by low income homeowners, was completed and a final report produced under the MOU.

Final reports were also completed on several other MOU projects including the Public Housing Air Seal Project, Point of Sale and the

Home Energy Analysis Trial (HEAT) project.

The video lending library, established in the 1987-88 fiscal year, loaned copies of more than 600 tapes on residential retrofit. A brochure promoting the service was revised and distributed.

Several transportation initiatives were undertaken under the MOU. In the Pro-Fisher Project, 36 information sessions on fuel economy were attended by a total of 450 fishermen. These sessions were held in conjunction with courses offered by the Nova Scotia Department of Fisheries. Information materials, seminars, and advice on vehicle fuel economy were provided to the commercial trucking industry under the Pro-Trucker Program. Fuel economy competitions were held at six high schools in cooperation with student driver education courses.

Display racks and literature on vehicle fuel economy were distributed through Registry of Motor Vehicles' offices in Nova Scotia. Videotapes on fuel efficient driving were distributed to 16 cable television stations for broadcast on community cable channels.

Staff represented the Department on numerous committees, including those of the Canadian Wood Energy Institute, R-2000 Regional Marketing Committee, Canadian General Standards Board's National Advisory Panel on Standards for Building Performance and the Nova Scotia Chapter of Society, Environment, and Energy Development Studies (SEEDS).

ENERGY EDUCATION PROGRAM

The Energy Education Program creates an awareness of efficient energy use and appropriate fuel substitution among youth and educational audiences. The primary focus of the Program has been in-class presentations to elementary and junior high students supplemented by student and teacher resource materials.

During the 1988-89 fiscal year, staff made 448 presentations to over 29,613 students in 156 schools. Learning resource materials and student activity sheets for elementary school children were prepared and distributed.

Staff prepared energy resource materials of particular relevance to the supply and utilization of energy in Nova Scotia, including a *second edition of Nova Scotia Energy Resources, A Booklet for*

Secondary Schools. In addition, "Nova Scotia: A Map of Energy Facts" was prepared for junior high school classrooms as part of staff participation on the Nova Scotia Chapter of Society, Environment and Energy Development Studies (SEEDS).

PROVINCIAL ENERGY ANALYSIS PROGRAM

The Provincial Energy Analysis Program (P.E.A.P.) provides on-site, computer-based energy analyses to public buildings such as hospitals, schools, provincial facilities and municipal buildings.

During the period of April 1, 1988 to March 31, 1989, 112 energy analyses were conducted in buildings which had a combined annual energy bill of $6,079,000. Energy efficiency improvements were identified in these buildings which could reduce annual energy costs by $751,750 or 12.4 per cent. A summary of energy analyses results for the 1988-89 fiscal year is provided in Table 8.

TABLE 8. Provincial energy analysis program results

	$	kwh
Total Energy Use	6,079,000	160,321,000
Average per site	54,300	1,431,000
Potential Savings	752,000	28,007,000
Per cent Savings	12.4	17.5

Number of Audits - 112

Substantial post analysis services to government clients were also provided by staff. These services involved assisting with the costing and planning of energy efficiency measures and providing technical information. Staff surveyed clients in order to document energy conservation improvements and to evaluate the subsequent energy savings.

Program staff assisted in developing an Internal Energy Management Policy to formalize an energy cost reduction strategy for public buildings which are owned or funded by the Province. This policy was approved by Cabinet in January 1989. The objective of the policy is to affect a $2.5 million per annum reduction in the Province's energy operating costs by the end of fiscal year 1991-92 while maintaining or improving the environmental quality in the targeted buildings. Elements of the policy include energy analyses and follow-up services, building operator training, energy accounting and retrofit financing.

With the ongoing increase in complexity of energy related building systems and the limited technical training of most building operators, many systems are improperly operated and maintained, resulting in significant energy inefficiencies. To address this problem building operator training courses and seminars were offered on three occassions to school and provincial building operators. These courses and seminars included presentations on energy management principles in the basic operation and maintenance of building systems.

Staff developed an energy accounting system (Eneraccount) to facilitate monitoring of energy consumption and energy costs for provincially funded facilities. Additional uses for the accounting system will include: providing a source of information for internal energy planning; increasing energy management awareness and effectiveness of public building owners, operators and users; and responding to requests for energy data for provincially funded buildings.

Additional attivities, mainly related to the dissemination of energy management information, were undertaken by PEAP staff during the past fiscal year. Staff participated in the development and provision of a number of energy management seminars in cooperation with the Technical University of Nova Scotia. Staff represented the department on the Nova Scotia Chapter of the federally sponsored Commercial and Office Buildings Energy Management Task Force, as well as the Industrial/Commercial Sub-committee of the Canada/Nova Scotia Memorandum of Understanding on Conservation and Alternative Energy.

Development work was begun on an energy analysis service to be offered to industrial and commercial facilities in the 1989-90 fiscal year. This service will focus on firms with limited internal technical expertise.

ECONOMICS AND STATISTICS DIVISION

V. Harnish, Director

INTRODUCTION

The Economics and Statistics Division was established in 1987-88. It has four primary responsibilities. These include:

- co-ordination of overall provincial energy planning activities,
- economic analysis, statistical and computer support services for the Energy Branch,
- policy advice on matters related to energy pricing, markets, transmission, resource procurement and availability, and
- making known the province's position on these matters to other levels of government and the private sector.

The Division prepares reports, position papers, publications and manages the preparation of studies by private consultants. Depending on the nature of the material, these studies are made available to other departments, the public, energy corporations and other governments and agencies. The Division also develops computer models for use within the Branch.

The Division is comprised of two Sections — Economic Analysis and Statistics and Computer Services — in line with the two main orientations of the Division.

Economic Analysis Section

The Economic Analysis Section is primarily responsible for overall energy planning, program evaluation, economic analysis and energy market monitoring. These responsibilities require the development of policy alternatives for senior Department officials, the selection and use of appropriate analytical techniques, direct and indirect participation in regulatory proceedings, and the occasional development of draft legislation.

ACTIVITIES

Evaluation of programs and activities performed by the Energy Branch has become a major task for the Division during the past two years. This includes using both economic impact and cost benefit analysis techniques in order to identify and quantify the various economic benefits that flow to Nova Scotians from program spending. Ongoing and completed projects of this nature undertaken in the past year include evaluations of the economic impacts created by energy producing industries, and a Benefits Evaluation of Wood Energy Projects.

As the impact of energy development on the environment captures more public attention, the Division has allocated more resources to this area of study. One initiative in this area is a response to the World Commission report on Environment and Development (Brundtland Commission). The Canadian Council of Resource and Environment Ministers produced a report on Environment and Economy recommending that each province address the problems discussed in the Brundtland Commission Report. Nova Scotia subsequently established an interdepartmental committee to develop an Action Plan for the Province which would lead to better integration of environmental considerations and economic development. Staff from the Economics and Statistics Division represented the Department on this interdepartmental committee.

Staff are also providing support to the Nova Scotia representative on the federal-provincial Energy Minister's Task Force on Energy and the Environment.

Division personnel assisted by representatives from the Energy Resources Division and the Department of the Attorney General completed the redrafting of regulations to the Nova Scotia Pipeline Act. These revisions were required to incorporate new regulatory policies governing natural gas in Canada as well as new technical specifications applicable to natural gas pipelines.

Section staff represented the Department on international and interprovincial committees related to energy. A staff member served on the Energy Emergency Planning Sub-Committee of the Northeast International Committee on Energy and also completed a term as Chairman to the Interprovincial Advisory Committee on Energy Demand Restraint Sub-Committee.

Other related duties performed during the year included an assessment of Nova Scotia's emergency response options to curtailments of any of its major energy supplies, completion of a study of the applicability of U.S. federal Public Utilities Regulatory Policies Act type legislation to Nova Scotia and monitoring developments in competing proposals to supply Northeast U.S. natural gas markets. Support activities to other Divisions of the Department included an analysis of the issues surrounding private power production in Nova Scotia and compilation of the Department's three year program plan. Section staff also prepared various briefing notes, ministerial briefing books and speeches for use by senior Department officials.

Statistics and Computer Services Section

The Statistics and Computer Services Section is responsible for energy database development and maintenance, analysis and dissemination of statistics and the provision of forecasts of energy demand and prices. The Section's other major responsibility is provision of computer software and hardware expertise to the Branch. Technical advice on computer equipment selection and the development of in-house programs are included in this activity.

ACTIVITIES

A major focus of Section activity during the past year has been the updating of Nova Scotia's 1985 long term energy demand forecasting model. The econometric energy demand model has been updated and revised to incorporate new economic trends that have developed since the 1985 forecast. Data to be used by the model has also been updated. The main effort in this regard has been a survey of major industries in the province in order to ascertain their energy consumption over the past four years. It is expected that a forecast of the Province's overall energy requirements into the next century will be completed in 1989.

Considerable effort was directed towards creating new databases and expanding, upgrading and updating various existing databases utilized by the Division to carry out its day to day activities. The main area of activity in this effort was the improvement of the Province's data on coal production and sales. This data will be updated on a regular basis and will prove to be a very useful source of common information not only for government but for the industry itself.

On-going duties of a statistical nature included the monthly publication of an information sheet on energy supply, demand and prices of coal, electricity and petroleum products in the Province. It also includes a section on leading economic indicators for the province as well as any recent economic developments that may impact on the Nova Scotia economy.

The annual Energy Statistical Profile for 1987 was updated for publication.

Due to the large scale integration of computers into the Department, the Division has played a key role in the development of a Long Range System Plan for computer equipment in the Energy Branch and the Department. Microcomputer systems are already in use for a wide variety of applications, with the long term goal being the networking of all computers within the Department.

Also in 1988-89, Division staff attended training courses to familiarize themselves with the new systems and in turn passed this training on to other members of the Branch. Several new software packages have been introduced to staff including Focus and dBase IV.

The Section provided computer programming and data entry support to the staff administering the Provincial Energy Analysis Program. As well, work was initiated on developing a computerized model for the Energy Accounting System operated by the Energy Management Division. This system will monitor energy use in 300 government and institutional establishments in Nova Scotia to determine changes in energy use patterns.

ADMINISTRATION DIVISION

C. R. James, C. M. A., Director

The Administration Division provides the Department with financial, operational, and personnel management. It also provides cartographic and administrative services to the Department and accounting services for Novaco Limited. The Director is Secretary-Treasurer of this crown corporation.

Within the Departmental Budget, the Administration Division consists of the Offices of the Minister and Deputy Minister, Energy Branch Administration, Mines and Minerals Branch Administration, and the Administration Division.

The duties and functions of the Division are divided into four sections: Accounting Services, Mineral Taxation and Fiscal Planning, Personnel and Administration, and Cartographic Services.

The Administration Division is responsible for mineral and petroleum resource revenue administration policy, the collection of mineral royalties and taxes, and for the management and evaluation of government funded coal mine and coal miner assistance programs.

Accounting Services Section

Ken Faulkner, C.M.A., Section Manager

The Accounting Services Section provides managerial and financial accounting services for the Department.

The Section is responsible for maintaining the computerized departmental accounting system which provides managerial control by recording and reporting expenditures monthly. The Management Information System provides a monthly and year-to-date report of expenditures and comparison to the Department's budget. These reports are circulated to Division Directors monthly and contribute to the Department's success in maintaining expenditures within budget authority. Budgeting responsibility and administration for the Department is coordinated in this Section by providing historical background, financial information, and by providing interpretation assistance to Budget Managers.

Two Coal Miners' Assistance Programs, the DOSCO (1923) pension and the Coal Miners' Pre-Retirement Leave Plan are administered by the Department. As of March 31, 1989, 27 former miners were receiving the DOSCO (1923) pension and 51 were receiving Pre-Retirement Leave benefits.

Mineral Taxation and Fiscal Planning Section

Blair McMullin, Section Manager

The Mineral Taxation and Fiscal Planning Section is responsible for resource revenue policy and administration of mineral royalty and tax legislation. This section also administers the Coal Mine Investment Security Program.

The Section also provides accounting services for Novaco Limited, a provincial crown corporation.

MINERAL ROYALTIES AND TAXES

This Section proposes legislative amendments and administers the royalty and tax provisions of the Mineral Resources and Gypsum Mining Income Tax Acts.

The revenue from royalties and taxes reported by the Department are shown for a 20 year period in Figure 9 and for the current fiscal year in Table 9.

TABLE 9. Royalties and taxes for the fiscal year 1988-89

Commodity	Royalty or Tax
Gypsum	$ 950,309
Coal	859,436
Salt	208,573
Other	672,925
Total	$ 2,691,270

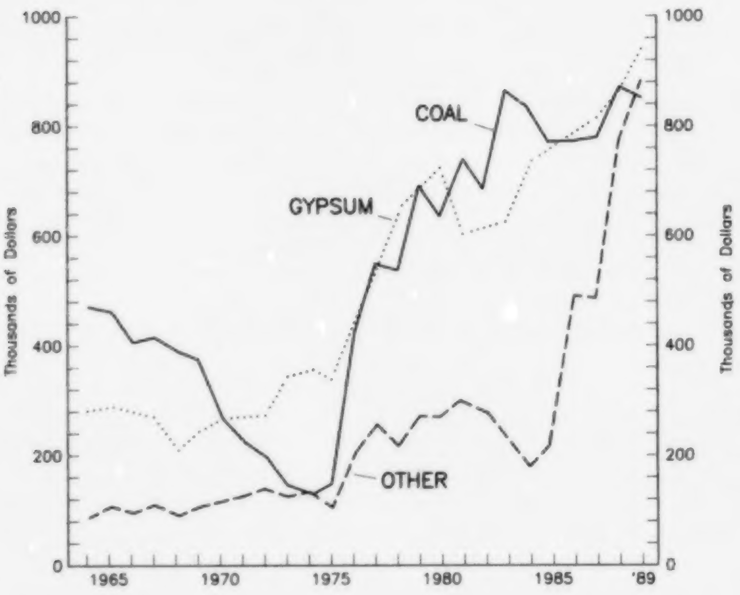


FIGURE 9. Historical trends of royalties and taxes.

COAL MINE INVESTMENT SECURITY PROGRAM

The Coal Mines Investment Security Program provides assistance to Evans Coal Mines Limited, St. Rose, Inverness County. The program is designed to promote self-sufficiency through operational efficiency and increased productivity. The operator is protected against major losses that could result from extended periods of low output.

NOVACO LIMITED

The Section administers the accounting control function of this Crown Corporation. Management information is provided on a monthly basis.

Personnel and Administration Section

P. Edwards, Section Manager

This Section provides advice and support on personnel management to all divisions of the Department. The responsibilities of the Section include recruitment, staff relations, compensation, establishment and maintenance of performance appraisal systems, career development training, personnel and payroll documentation, and the maintenance of employee records. The Section is also responsible for the continual upgrading of office and administrative services for the Department.

Our university employment program provided summer jobs for 48 students.

In consultation with the Department of Government Services and the Civil Service Commission work continued on a computerized Human Resource Management System. All development for payroll functions has been completed and implementation of Phase 1 is scheduled for early in 1989-90.

A modified work week program was implemented for Halifax office based staff in 1988-89. This program allows eligible employees to extend daily hours of work in exchange for time off at a later date subject to managerial approval.

In accordance with the new Occupational Health & Safety Act, Occupational Health & Safety committees were established in the Department in order to provide a forum for joint labour-management consultation on, and development of solutions to safety and health problems in the workplace.

Staff attended various in-service and external courses and programs covering areas such as management and supervisory development, communication skills, clerical/secretarial development, and occupational health and safety.

Personnel changes are shown in Table 10.

TABLE 10. Personnel changes during the 1988/89 fiscal year

APPOINTMENTS	SEPARATIONS
Andrew Kendall	Udeni Amit
Jane MacNeill	Valerie Jansen
Bill O'Halloran	Janet Gillespie-Wood
Kathy Coolen	Rita Jones
Angela Smith	Doug Engram
Isabel Cameron	Doug Rigby
Brian Mott	Jim Patterson
Janette Freeman	Robert Turner
Roxanne Ryan	

TRANSFERS

Joan Collier
Brian MacInnis
Sandy Anderson
Jane MacNeill
Scott McKellar

Cartographic Section

Joe Campbell, Section Manager

Drafting and photographic services are provided by the Cartographic Section for all divisions of the Department. The drafting component is responsible for the production of a wide variety of geological and energy related drawings for use in publications and visual presentations. The past year saw the increased use of the section's computer assisted design (CAD) system in the production of page size drawings, 35 mm and overhead slide copies, personnel charts/flow diagrams and floor plans.

The photographic unit reproduced material for publications, slides for audio visual presentations and photographs for graphic displays. Field photography was also carried out for several sections of the Department.

FINANCIAL INFORMATION

INTRODUCTION

The Department of Mines and Energy had 168 people on staff as of March 31, 1989. During the 1988/89 fiscal year, the Department administered forecasted expenditures of $14,294,200 while recovering $2,554,500 from various funds. Royalties and mining taxes and the licences and fees were for total revenue of $3,480,994.

Expenditure information is presented in Table 11 under three headings. Operations and assistance are budgeted in the Department. Other includes expenditures budgeted under the Department of Industry, Trade and Technology.

Operations information is presented by budget subject title by division. Assistance information is presented by budget subject title under two sectors: Mining Industry and Energy. Other is presented by the legislative vote title or the department where the funds have been budgeted.

As the expenditure information provided was drawn from the publications *Estimates of the Government of Nova Scotia and Public Accounts of the Province of Nova Scotia*, the subject titles may differ from the sectional titles drawn from the Department Organization Chart.

TABLE 11. Financial information about the Department of Mines and Energy.

Division Activity Budget Subject Title	Actual Expenditure 1987-88	Estimate 1988-89	Final Forecast 1988-89
OPERATIONS			
ADMINISTRATION DIVISION			
1. Office of the Minister and Deputy Minister	$ 436,097	$ 481,400	$ 460,200

TABLE 11. continued

2. Accounting, Personnel and Administration	546,694	630,400	588,200
3. Cartographic Services	317,830	336,100	336,100
4. Energy Branch Administration	346,976	503,200	447,500
5. Mines and Minerals Branch Administration	441,941	462,000	461,000
TOTAL Administration Division	**$2,089,538**	**$2,413,100**	**$2,293,000**
ECONOMICS AND STATISTICS	**$ 86,450**	**$ 437,200**	**$ 368,600**
ENERGY MANAGEMENT DIVISION			
1. Provincial Energy Analysis	$ 337,627	$ 336,000	$ 323,900
2. Energy Advisory Services	482,017	504,600	468,300
3. Energy Engineering	208,433	299,200	253,300
4. National Conservation and Alternative Energy Initiatives	475,585	1,025,000	324,000
TOTAL Energy Management Division	**$1,503,662**	**$2,164,800**	**$1,369,500**
ENERGY RESOURCES DIVISION			
1. Petroleum Resources	$ 454,344	$ 570,900	$ 506,400
2. Coal Exploration	294,116	303,900	294,100
3. Coal Development and Utilization	164,946	181,300	192,500
TOTAL Energy Resources Division	**$ 913,406**	**$1,056,100**	**$ 993,000**

TABLE 11. continued

Division Activity Budget Subject Title	Actual Expenditure 1987-88	Estimate 1988-89	Final Forecast 1988-89
DRILL AND MECHANICAL DIVISION			
1. Drilling Services	$ 580,407	$ 599,200	$599,200
2. Operations & Maintenance	335,751	325,900	346,000
TOTAL Drill and Mechanical Division	**$ 916,158**	**$ 925,100**	**$945,200**
MINING ENGINEERING DIVISION			
1. Mining Engineering	$ 195,364	$ 236,800	$237,200
TOTAL Mining Engineering Division	**$ 195,364**	**$ 236,800**	**$237,200**
MINERAL RESOURCES DIVISION			
1. Mineral Resource Evaluation	$ 266,888	$ 259,400	$250,300
2. Regional Surveys	340,742	334,800	327,700
TOTAL Mineral Resources Division	**$ 607,630**	**$ 594,200**	**$578,000**

TABLE 11. continued

MINERAL DEVELOPMENT DIVISION			
1. Resource Geology	$ 145,701	$ 157,000	$162,400
2. Regional Exploration Services	209,761	232,500	234,000
3. Library Services	231,631	201,500	184,100
4. Mineral & Petroleum Titles	112,870	122,400	129,000
TOTAL Mineral Development Division	**$ 699,963**	**$ 713,400**	**$709,500**
TOTAL OPERATIONS	**$7,312,171**	**$8,540,700**	**$7,544,600**

Division Activity Budget Subject Title	**Actual Expenditure 1987-88**	**Estimate 1988-89**	**Final Forecast 1988-89**
ASSISTANCE PROGRAMS			
MINING INDUSTRY ASSISTANCE			
1. Coal Miners' Assistance	$ 395,526	$ 410,000	$360,000
2. Coal Development - Novaco	73,400	75,000	25,000
3. Coal Mines Investment Security Program	155,609	156,000	78,000
4. Abandoned Mine Site Reclamation	-	19,600	19,600
5. Glace Bay Miners Work Program	-	-	250,000
TOTAL Mining Industry Assistance	**$ 624,535**	**$ 660,600**	**$732,600**

TABLE 11. continued

ENERGY ASSISTANCE			
1. Coal Liquefaction	$ 249,976	$ 250,000	$ 249,100
2. Oil Substitution	798,469	1,500,000	2,230,000
3. Wood Energy Conversion Studies		100,000	23,000
TOTAL Energy Assistance	**$1,048,445**	**$1,850,000**	**$2,502,100**
TOTAL ASSISTANCE	**$1,672,980**	**$2,510,600**	**$3,234,700**
OTHER PROGRAMS			
OTHER			
1. Mineral Development Subsidiary Agreement Budgeted in Department of Industry, Trade and Technology	$3,662,948	$3,214,300	$3,514,900
TOTAL OTHER	**$3,662,948**	**$3,214,300**	**$3,514,900**
TOTAL EXPENDITURES ADMINISTERED BY DEPARTMENT OF MINES AND ENERGY	**$12,648,099**	**$14,265,600**	**$14,294,200**

LEGISLATION

INTRODUCTION

The Nova Scotia Department of Mines and Energy receives its mandate from the Public Service Act. This Act provides for a Department of Mines and Energy and the appointment of a Deputy Minister. It also provides for the function of the Department and its employees.

The following Acts are administered by the Department of Mines and Energy:

Mineral Resources Act S.N.S. 1975, c.12.

The Mineral Resources Act governs the administration, ownership and disposition of mineral rights. It also provides for resource management requirements, and royalties.

Treasure Trove Act R.S.N.S. 1967, c.314.

The Treasure Trove Act regulates the exploration for precious stones and metals in a state other than their natural state. Requirements for exploration and royalties are provided by Order of the Governor in Council.

Coal Mines Regulation Act R.S.N.S. 1967, c.36.

The Coal Mines Regulation Act governs operation and safety in provincial coal mines. Coal mines operated by the Federal Government through Crown corporations, such as the Cape Breton Development Corporation, are inspected and regulated under the Canada Labour Code. Provincial coal mines are inspected by inspectors with the Nova Scotia Department of Labour.

Gas Storage Exploration Act S.N.S. 1970, c.6

The Gas Storage Exploration Act governs exploration and development of underground storage of liquid or gaseous petroleum products.

Metalliferous Mines and Quarries Regulation Act R.S.N.S. 1967, c.183.

The Metalliferous Mines and Quarries Act governs operation and safety in mines and quarries that are not otherwise covered by the Coal Mines Regulation Act. Quarries operated by the Department of Transportation do not fall under this Act. Inspections are performed by Nova Scotia Department of Labour.

Gypsum Mining Income Tax Act R.S.N.S. 1967, c.122

The Gypsum Mining Income Tax provides for reporting procedures and mining tax formulae for gypsum mining operations in the Province.

An Act to Confer Certain Powers Upon the Lieutenant Governor in Council and to Amend the Mines Act S.N.S. 1918, c.16

Certain powers are conferred on the Lieutenant Governor in Council for the purpose of maintaining an acceptable level of stability in the Coal Mining Industry. The Act provides authority for a subvention program for independent coal mine operators, a pre-retirement leave program, coal waste dumps reclamation project, and operation of Novaco.

Petroleum Resources Act S.N.S. 1980, c.12.

The *Petroleum Resources Act* came into force July 28, 1984 and it regulates the administration and distribution of petroleum rights in Nova Scotia.

Energy and Mineral Resources Conservation Act S.N.S. 1980, c.5.

The *Energy and Mineral Resources Conservation Act* provides authority to establish an Energy Board to hear matters arising out of such Acts as the Gas Utilities Act, Pipeline Act, etc. By amendment the Governor in Council may amend the application of this Act may designate the Public Utilities Board of Commissioners as the Energy Board. This Act and the amendment came into force July 28, 1984.

Gas Utilities Act S.N.S. 1980, c.7.

The *Gas Utilities Act* regulates the process wherein an applicant may seek and obtain approval to operate a gas utility. By amendment (S.N.S. 1984, c.60) the Act may be limited to certain geographic areas and certain operations. The Act and amendment came into force July 28, 1984.

Pipeline Act S.N.S. 1980, c.13.

The *Pipeline Act* regulates all aspects of transmission of oil and gas. The Act may be limited to certain transmission lines and certain geographic areas as provided for in S.N.S. 1984, c.65. The Act and amendment came into force July 28, 1984.

Canada-Nova Scotia Oil and Gas Agreement Act S.N.S. 1984, c.2.

The *Canada-Nova Scotia Oil and Gas Agreement Act* mirrors federal legislation implementing and giving effect to the Canada-Nova Scotia Agreement on Offshore Oil and Gas Resources Management and revenue sharing providing the framework for administration and regulation of offshore oil and gas exploration and production.

Offshore Oil and Gas Act S.N.S. 1984, c.8.

The *Offshore Oil and Gas Act* is another of the offshore legislation package. This Act, along with the federal counterpart, regulate acquisition and disposition of offshore oil and gas rights. Crown share, Canadian ownership rates, transfers, and other matters are also addressed.

Oil and Gas Production and Conservation (Nova Scotia) Act S.N.S. 1984, c.9

Exploration, drilling, development, and production of oil and gas in the offshore are regulated by the *Oil and Gas Production and Conservation (Nova Scotia) Act* and the federal counterpart.

Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation (Nova Scotia) Act S.N.S. 1987, c.3 (Unproclaimed) This act will be available upon proclamation.

Offshore Petroleum Royalties Act S.N.S. 1987, c.9 (Unproclaimed)

Offshore Petroleum Resources Act S.N.S. 1987, c.8 (Unproclaimed)

Oil and Gas Production and Conservation (Nova Scotia) Act S.N.S. 1987, c.10 (Unproclaimed)

Please note that once proclaimed, the above noted acts will implement the offshore accord and will repeal the existing provincial offshore legislation.

APPENDIX A

PUBLICATIONS
MINES AND MINERAL BRANCH

BULLETINS

Bulletin 6	Evaluation of Nova Scotia's Peatland Resources by A. R. Anderson and W. A. Broughm, 1988.	$15.00

INFORMATION CIRCULARS

No. 11	A Walking Tour of Rocks, Minerals, and Landforms of Victoria Park, Truro, by Howard Donohoe and Martha Devanney, 1987.	FREE
No. 12	Building Stone in Nova Scotia, by G. B. Dickie, 1988.	FREE
No. 13	Limestone and Dolomite in Nova Scotia, by P. Luke and R. H. MacDonald, 1988.	FREE
No. 14	Silica in Nova Scotia, by R. H. MacDonald, 1988.	FREE
No. 15	Barite, Celestite and Fluorite in Nova Scotia, by J. H. Fowler, 1988.	FREE
No. 16	Gypsum and Anhydrite in Nova Scotia, by G. C. Adams, 1988.	FREE
No. 17	Diatomite in Nova Scotia, by A. R. Anderson, 1988.	FREE
No. 18	Peat Moss in Nova Scotia, by A. R. Anderson, 1988.	FREE
No. 19	Salt in Nova Scotia, by G. Prime, 1988.	FREE

No. 20	Aggregates in Nova Scotia, by G. Prime, 1988.	FREE
No. 21	A Walking Tour of Rocks, Minerals, and Building Stones of Prince Street, Truro, by Jo-Anne Goodwin, et al., August 1988.	FREE
No. 22	Land Use Policy Development Project, by David B. Hopper and Andrew J. D. Kendall, November 1988.	FREE

INFORMATION SERIES

No. 14	Reflection Seismic Coverage of Onshore and Nearshore Nova Scotia 1942-1987, compiled by P. G. McMahon, 1988, 34 pages + 3 maps in back pocket.	$5.00

MAPS

Maps 88-13 88-14	Surficial Geology of Parts of Colchester, Cumberland, Pictou and Hants Counties, Nova Scotia (sheets 10 & 11), by R. R. Stea and P. W. Finck, scale 1:100 000.	$8.00 Set
Map 89-1	The Peatland Areas of Nova Scotia, by A. R. Anderson and W. A. Broughm, Sheet 1, (Southwestern Nova Scotia), scale 1:250 000, 1986.	$3.00
Map 89-2	The Peatland Areas of Nova Scotia, by A. R. Anderson and W. A. Broughm, Sheet 2, (Central Nova Scotia), scale 1:250 000, 1986.	$3.00
Map 89-3	The Peatland Areas of Nova Scotia, by A. R. Anderson and W. A. Broughm, Sheet 3, (Cape Breton Island), scale 1:250 000, 1986.	$3.00

MISCELLANEOUS PUBLICATIONS

MP 88-1	Nova Scotia Oil and Gas Report 1988.	$2.00
MP 88-2	Industrial Mineral Mining in Nova Scotia: Proud Tradition, Bright Future, 1988.	FREE

OPEN FILE MAPS

OFM 88-001 88-012	Mineral Resource Land Use Maps for Halifax County, by D. B Hopper and C. A. Dobson, 1988, 12 maps, scale 1:50 000. ($2.00 per map)	$24.00 Set
OFM 88-013	Preliminary Geological Map of Chester (21A.09), by M. C. Corey, scale 1:50 000.	$2.00
OFM 88-015	Preliminary Geological Map of Windsor (21A/16) West Half and part of (21H/01), by L. J. Ham, scale 1:50 000.	$2.00
OFM 88-016	Preliminary Geological Map of Gaspereau Lake (21A/15) and part of (2H/02), by M. A. MacDonald and L. J. Ham, scale 1:50 000.	$2.00
OFM 88-017 88-022	Mineral Resource Land Use Maps for Hants County, by D. B. Hopper and H. J. Gillis, 1988, 6 maps, scale 1:50 000. ($2.00 per map)	$12.00
OFM 88-024	Geological Map of New Minas-Canaan Quadrangle, compiled by Dr. Stewart A. Ferguson 1976-1978, 1985-1987, scale 1:10 000.	$2.00
OFM 88-031	Till Geochemistry Map, Pictou and Antigonish Counties (sheet 12), by R. G. Turner and R. R. Stea, scale 1:100 000.	$2.00

OFM 88-032	Till Geochemistry Map, Northern Mainland Nova Scotia, Heavy Mineral Separate Analyses (sheet 12), by R. G. Turner and R. R. Stea, scale 1:100 000.	$2.00
OFM 88-033 88-038	Mineral Resource Land Use Maps For Cape Breton County, by D. B. Hopper and H. J. Gillis, 1988, 6 maps, scale 1:50 000. ($2.00 per map)	$12.00 Set
OFM 88-050	Till Geochemistry of Northern Mainland Nova Scotia Clay Fraction Analysis, Antigonish and Guysborough Counties, by R. G. Turner and R. R. Stea, Map Sheet 13-88, scale 1:100 000.	$2.00
OFM 88-051	Till Geochemistry of Northern Mainland Nova Scotia Heavy Mineral Separate Analyses, Antigonish and Guysborough Counties, R. G. Turner and R. R. Stea, Map sheet 13-88, scale 1:100 000.	$2.00
OFM 89-001	Geological Map of Kentville-South Alton Quadrangle, scale 1:10 000, compiled by Stewart A. Ferguson, 1987-1988.	$2.00
OFM 89-002	Geological Map of West Gore Quadrangle, scale 1:10 000, by R. G. Moore, 1988.	$2.00
OFM 89-003	Geological Map of Newport Corner Quadrangle, scale 1:10 000, by R. G. Moore, 1988.	$2.00

OPEN FILE REPORTS

OFR 88-013	A Study of U.S. East Coast Industrial Mineral Markets for New Brunswick, Newfoundland and Nova Scotia, by Metals Economics Group, 1988. Prepared for Mineral Policy Sector, Energy Mines and Resources Canada, 286 pages.	$15.00
OFR 88-039	Marine Transport Study for Nova Scotia by Leslie MacIntyre Maritime Associates Inc., May 1988. Prepared for Mineral Policy Sector, Energy, Mines and Resources Canada, 38 pages.	$5.00
OFR 88-040	Aggregate Market Study for New Brunswick and Nova Scotia, by ADI Limited, 1988. Prepared for Mineral Policy Sector, Energy, Mines and Resources Canada, 309 pages.	$17.00
OFR 88-055	Multielement Ratings Maps for Meguma Zone Lake Sediments, by P. J. Rogers, 1989, 34 pages, 3 maps.	$5.00
OFR 88-056	An Assessment of the Hydrocarbon and Compressed Air Storage Potential of Nova Scotia Salt Deposits, by Nolan, Davis & Associates Ltd., 1988, 1 195 pages.	$20.00
OFR 88-057	Gypsum, Anhydrite Potential, Meadows Road Area, Cape Breton County, by G. Adams, 1988, 29 pages.	$5.00

OFR 88-059	Interpretation of Till Geochemical Data in Nova Scotia, Canada, Using Mapped Till Units, Multi-Element Anomaly Patterns, and the Relationship of Till Clast Geology to Matrix Geochemistry, by R. G. Turner and R. R. Stea, 1988, 39 pages.	$5.00
OFR 88-063	An Assessment of the Hydrocarbon and Compressed Air Storage Potential of Nova Scotia: A Summary, by Nolan, Davis & Associates Ltd., 1988, 22 pages.	$3.00
OFR 89-003	Open File Report on Selected Mineral Occurrences of the Antigonish Area, NTS 11E/08, 09 and 16, by K. E. Northcote, G. DeMont and A. Armitage, February 1989, 184 pages plus many tables.	$15.00
OFR 89-004	Open File Report on Selected Mineral Occurrences of Southern Cape Breton Island, Nova Scotia, NTS 11F/10, 11F/15, 11F/16, 11K/01, 11K/02, by K. E. Northcote, G. DeMont and A. Armitage, March 1989, 94 pages plus many tables.	$10.00
OFR 89-005	Open File Report on Selected Mineral Occurrences of the Cobequid Area, Nova Scotia, NTS 11E/05, 11E/06, 11E/10, 11E/11, 11E/12, 21H/07, 21H/08, by K. E. Northcote, G. DeMont and A. Armitage, March 1989, 180 pages plus many tables.	$15.00

PAPERS

Paper 89-1	Metallogenic Studies of South Eastern Cape Breton Island, by A. S. Macdonald, 1989.	$20.00

REPORTS

Report 87-4	Drilling Logs of Government Core Drills, 1986, compiled by C. Kavenaugh, 1987, 64 pages.	$5.00
Report 88-1	Mines and Minerals Branch, Report of Activities 1987, Part B, 292 pages. (Microfiche: $4.00)	$20.00
Report 88-2	Index to Assessment Reports, Publications, Open File Reports and Open File Maps for 1987, by Norman A. Lyttle, Janet Gillespie-Wood and Kirsten Lindgreen, 1988, 346 pages. (Microfiche: $4.00)	$20.00
Report 88-3	Mines and Minerals Branch, Report of Activities 1988, Part A, 250 pages. (Microfiche: $3.00)	$7.00

REPRINTS

Reprint 88-01	Metasomatic Origin of Spessartine-Rich Garnet in the South Mountain Batholith, Nova Scotia, by Daniel J. Kontak and Michael Corey; *in* Canadian Mineralogist, vol. 26, pp. 315-334. (Microfiche $1.00)	$1.00
Reprint 88-04	Silurian-Permian Palaeocontinental Reconstructions and Circum-Atlantic Tectonics, by D. V. Kent and J. D. Keppie; *in* The Caledonian-Appalachian Orogen, Geological Society Special Publication No. 38, pp. 469-480.	FREE
Reprint 89-1	Anatomy of a Telescoped Pull-Apart Basin: an Example from the Cambro-Ordovician Rocks in the	FREE

	Antigonish Highlands of Nova Scotia, by J. D. Keppie and J. B. Murphy; *in* Maritime Sediments and Atlantic Geology, v. 24, 1988, p. 1223-138.	
Reprint 89-2	Carbonate Buildups of the Gays River Formation, Lower Carboniferous Windsor Group, Nova Scotia, by R. C. Boehner, P. S. Giles, D. A. Murray and R. J. Ryan; *in* Reefs, Canada and Adjacent Area, Canadian Society of Petroleum Geologists, Memoir 13, 1989, p. 609-621.	FREE
Reprint 89-3	Carbonate Buildups of Windsor Group Major Cycle 2: Maxner and Miller Limestones, Miller Creek Formation and Mosher Road Member, Elderbank Formation and B_2 Limestone, Nova Scotia, by R. C. Boehner; *in* Reefs, Canada and Adjacent Area, Canadian Society of Petroleum Geologists, Memoir 13, 1989, p. 600-608.	FREE
Reprint 89-4	A Lacustrine Limestone Mound (Algal Reef) in the Wilkie Brook Formation (Horton Group), Cape George Area, Northeastern Mainland Nova Scotia, by R. C. Boehner and B. E. MacBeth; *in* Reefs, Canada and Adjacent Area, Canadian Society of Petroleum Geologists, Memoir 13, 1989, p. 626-630.	FREE

Reprint 89-5	Carbonate Bioherms in the Kennetcook and Herbert River Limestone Members, Upper Part of the Windsor Group, Central Mainland Nova Scotia, by R. C. Boehner, R. J. Horne and R. J. Ryan; *in* Reefs, Canada and Adjacent Area, Canadian Society of Petroleum Geologists, Memoir 13, 1989, p. 622-625.	FREE

ENERGY MANAGEMENT DIVISION

1.	Home Heating Workbook (revised) - a 32 page booklet on heating options for the home.	FREE
2.	Sealing, Weatherstripping and Caulking - a 56 page booklet on draftproofing the home.	FREE
3.	Oil Heating in the Home - a pamphlet on servicing and purchasing residential oil heating systems.	FREE
4.	Energy Advisor - a 16 page quarterly technical bulletin on energy for the residential housing industry.	FREE
5.	Nova Scotia Energy Resources, A booklet for Secondary Schools (second edition) - an energy resource guide for teachers.	FREE
6.	Nova Scotia: A Map of Energy Facts - a teacher resource for junior high school teachers.	FREE

APPENDIX B

PRODUCTION INFORMATION FROM MINES, QUARRIES AND OTHER OPERATIONS

The mining industry in Nova Scotia directly employs 5800 people (Fig. B-1) who produce mineral commodities valued at $505 million (Fig. B-2). Historical trends in mineral commodity value have shown a continued growth (Fig. B-3).

In this appendix each production site is described and located. Tables B-1 to B-5 summarize the production figures for each commodity or mineral. Site locations are shown on the accompanying maps, Figures B-4 to B-5. Production data is for the calendar year January 1, 1989 to December 31, 1989.

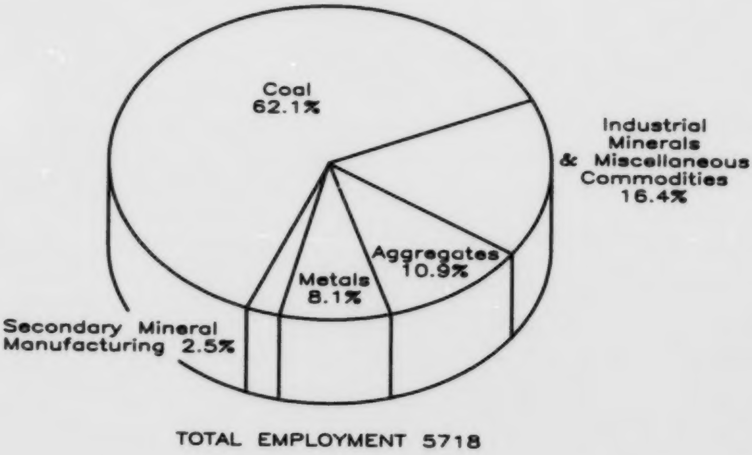
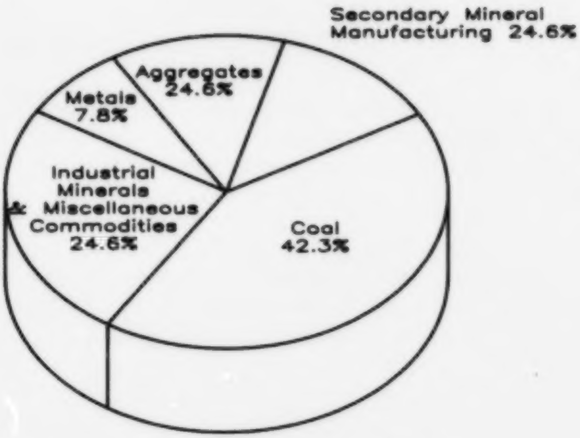


FIGURE B-1. Employment by mineral commodity as a percentage of the total employment

METAL AND GOLD MINES

The locations of metal mines and development projects are shown on Figure B-4.



TOTAL VALUE OF MINERAL PRODUCTION
$504.8 MILLION

FIGURE B-2. Value of mineral commodity groups as a percentage of the total mineral production

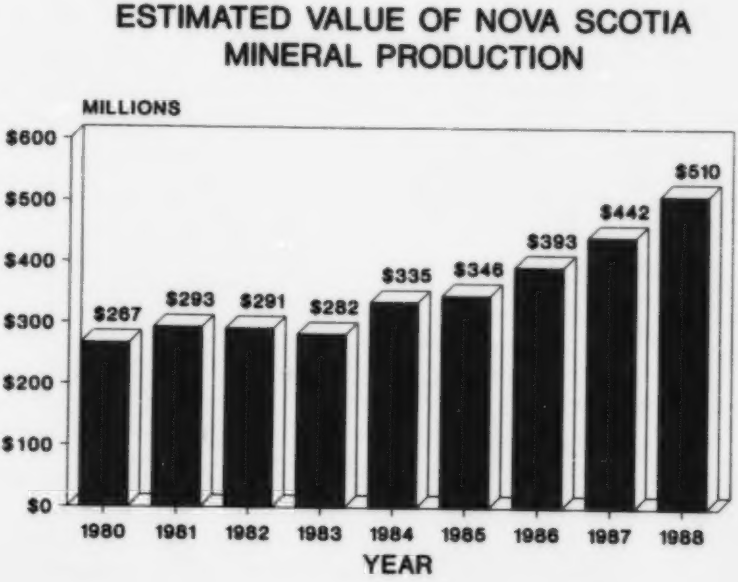


FIGURE B-3. Historical trend of the value of unprocessed mineral production

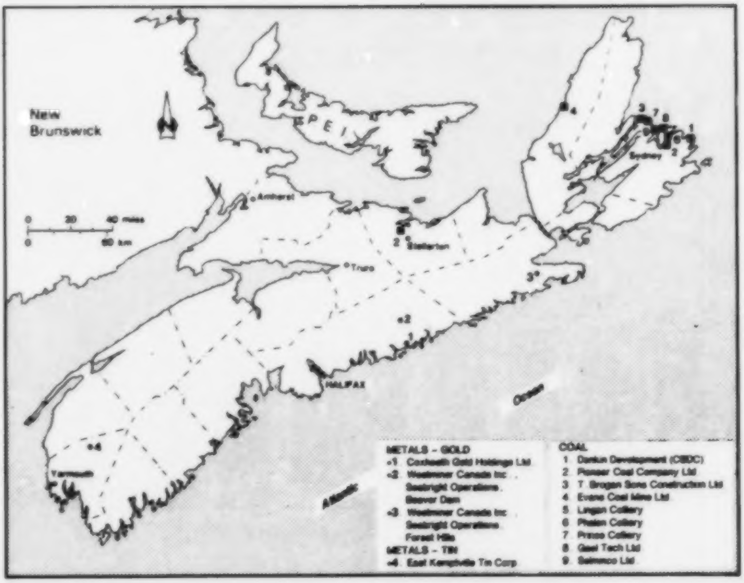

New Brunswick
P E I
0 20 40 miles
0 60 km
Amherst
Truro
2 Stellarton
3
2
4
Yarmouth
HALIFAX
Sydney
1 2 3 4 5 6 7 8 9
Atlantic
Ocean
METALS – GOLD
1. Coxheath Gold Holdings Ltd
2. Westminer Canada Inc., Seabright Operations, Beaver Dam
3. Westminer Canada Inc. Seabright Operations Forest Hills
METALS – TIN
4. East Kemptville Tin Corp
COAL
1 Devco Development (CBDC)
2 Pioneer Coal Company Ltd
3 T. Brogan Sons Construction Ltd
4 Evans Coal Mine Ltd
5 Lingan Colliery
6 Phalen Colliery
7 Prince Colliery
8 Gael Tech Ltd
9 Salmoco Ltd

FIGURE B-4. Locations of metal mines and coal mines

Gold

The gold mining sector remained active in 1988. Several companies obtained permits for extracting bulk samples for milling tests to assess grades and gold recovery. Three operators reported gold production from bulk sample tests. Westminer Canada Ltd. reported 6,408 troy ozs. from their Forest Hill property and 459 troy ozs. from their Beaver Dam property. NovaGold Resources Inc. reported 56 ozs. from their Cochrane Hill property and 14 ozs. from their Fifteen Mile Stream property. Edgar Horne reported 6 ozs. from his Renfrew property.

COXHEATH GOLD HOLDINGS LIMITED

Manager:	B. Rodgers
Address:	Tangier Mine, P. O. Box 28 Tangier, N. S. B0J 3H0
Production:	436 troy ozs.
Employees:	93

Coxheath Gold Holdings Limited were the first of the potential gold producers to obtain a mining lease. Part of their production was from bulk sample tests prior to obtaining Mining Lease No. 88-2 on 19th December 1988. Various types of mining methods are being tried by the company to determine the most economic method for extracting the ore from the narrow veins.

The ore is processed in a 200 ton/day gravity mill, producing bullion for sale to the mint and a concentrate containing gold and sulphides that is currently being stockpiled.

Metal Mines

The open pit tin mine at East Kemptville operated by Rio Algom Tin Corporation is the Province's only base metal producer. Details of the operation are given below. The location is shown on Figure B-4 and production in Table B-1.

RIO KEMPTVILLE TIN CORPORATION

Manager:	K. Collison, P.Eng.
Address:	P. O. Box 6, East Kemptville, N. S. B0W 1Y0
Production:	4142 tons (3 758 t) tin in concentrate 488 tons (443 t) copper in concentrate 104 tons (94 t) zinc in concentrate 16,791 ozs. (522.3 kg) silver in concentrate
Employees:	232

The ongoing metallurgical research continued in the mill with pilot plant trials of a Kelsey Jig and a tin flotation circuit. The tin flotation circuit proved to be a more economically attractive way to improve tin recovery so a full size circuit is under construction and is expected to be commissioned in May 1989.

Improved plant performance allowed the first shipments of zinc concentrate.

COAL MINING OPERATIONS

In April, 1988 there were four underground coal mines, three open pit mines and one coal dump reclamation plant in operation. Table B-2 summarizes production information for the coal mines. The location of these operations is shown in Figure B-4. A mining lease has been issued to Westray Coal Inc. to establish a new underground coal mine in the New Glasgow area.

Underground Coal Mines

EVANS COAL MINES LTD.

Manager: G. Evans
Address: R. R. # 1, Inverness, N. S. B0E 1N0
Production: 38,852 tons (35 246 t) coal
Employees: 45

The St. Rose Colliery, Inverness County, is owned and operated by Evans Coal Mines Ltd. Production is from development headings or from room and pillar mining followed by pillar recovery.

The company is still experiencing a problem with increased quantities of water entering the mine. The attempt to seal off the source of the water failed and the mine pumping system is being upgraded to cope with the gradually increasing water flow.

CAPE BRETON DEVELOPMENT CORPORATION

Manager: Robert Cooper, P.Eng.
Vice President, Mining Operations
Address: P. O. Box 2500, Sydney, N. S. B1P 6K9
Production: 3,268,146 tons (2 964 842 t) coal
Employees 3,398

The Cape Breton Development Corporation (CBDC) is a federal crown corporation that operates three producing underground coal mines in Cape Breton County. The Corporation has suspended the development of the Donkin Mine for an indefinite period. All mining operations were suspended from January 25, 1989 until April 13, 1989 due to a strike by the Corporation's railway and shop workers.

Lingan Colliery

Raw Coal Production: 1,210,024 tons (1 097 716 t)

This mine is located at Lingan near New Waterford, Cape Breton

County. Coal is recovered by a fully mechanized advance longwall method.

Longwall panel No. 7 West worked all year. Longwall panel No. 10 East and No. 11 East panel were put into production during the year.

Operations at the mine were suspended for a few days following an inflow of water that affected both Lingan and Phalen Collieries.

Phalen Colliery

Raw Coal Production: 1,577,607 tons (1 431 196 t)

The Phalen Colliery near New Waterford, Cape Breton County commenced production in 1987. The coal is extracted by a fully mechanized retreat longwall method. Longwall panels No. 1 West and No. 2 East were worked all year. The No. 2 West panel started production, No. 2 East panel is fully developed ready to start production, and No. 3 West panel and No. 3 East panel are under development.

Operations were suspended for a few days following an inflow of water that also affected the Lingan Colliery.

Prince Mine

Raw Coal Production: 1,389,866 tons (1 260 866 t)

This mine is located at Point Aconi, Cape Breton County. The coal is extracted by a fully mechanized retreat longwall method. Coal production from No. 6 West panel continued all year, No. 7 West panel and No. 8 East panel started production during the year and No. 8 West panel is under development.

Surface Coal Mines

PIONEER COAL CO. - Westville, Pictou County

Manager: D. Cook
Address: P. O. Box 929, Westville, N. S. B0K 2A0
Production: 98,712 tons (89 551 t) coal
Employees: 32

Extraction of the Acadia Seam crown pillar by open pit method continued in 1988. The Drummond Road was temporarily closed to allow coal situated below the road to be removed. Following coal extraction, the company backfilled the area and reconstructed the Drummond Road.

A 100 ton/hr. (90 t/hr.) wash plant was constructed at the mine to process the Drummond Dump material. Additional exploration is taking place to determine if reserves exist in the Acadia Seam east of the previous workings.

PIONEER COAL CO. - Reserve Mines, Cape Breton Co.

Production:	102,824 tons (93 281 t) coal
Employees:	35

The coal is mined from the Gardiner and O'Dell seams by open pit method. The mine is located east of Reserve Mines, Cape Breton County near the Sydney Airport. The operation includes a 100 ton/hr. (90 t/hr.) heavy media wash plant.

T. BROGAN & SONS CONSTRUCTION LTD.

Manager:	T. Brogan
Address:	P.O. Box 199, Florence, N. S. B0C 1J0
Production:	14,030 tons (12 728 t) coal
Employees:	12

An open pit coal mine is operated at Point Aconi, Cape Breton County, by this company. The overburden is removed by a dragline excavator, and the exposed coal is ripped with a bulldozer and loaded into trucks with a front-end loader.

Coal Reclamation Plants

GUILDCRAFT/GAEL TECH INC.

Manager:	Tony Fisher
Production:	37 004 tons (33 570 t) reclaimed coal
Employees:	30

This company has a plant to reclaim coal from the fines previously discarded by the Sydney Mines Wash Plant.

INDUSTRIAL MINERALS MINING

Industrial minerals form a significant part of the total mineral production in Nova Scotia. Seventeen industrial mineral producers operating at 28 sites produce gypsum, salt, anhydrite, limestone, barite, dolomite, clay and shale, silica sand, peat, and dimension stone. The locations of these mines or quarries is shown on Figure B-5. Table B-3 summarizes production information. Additional information about secondary manufacturing is given in Table B-4.

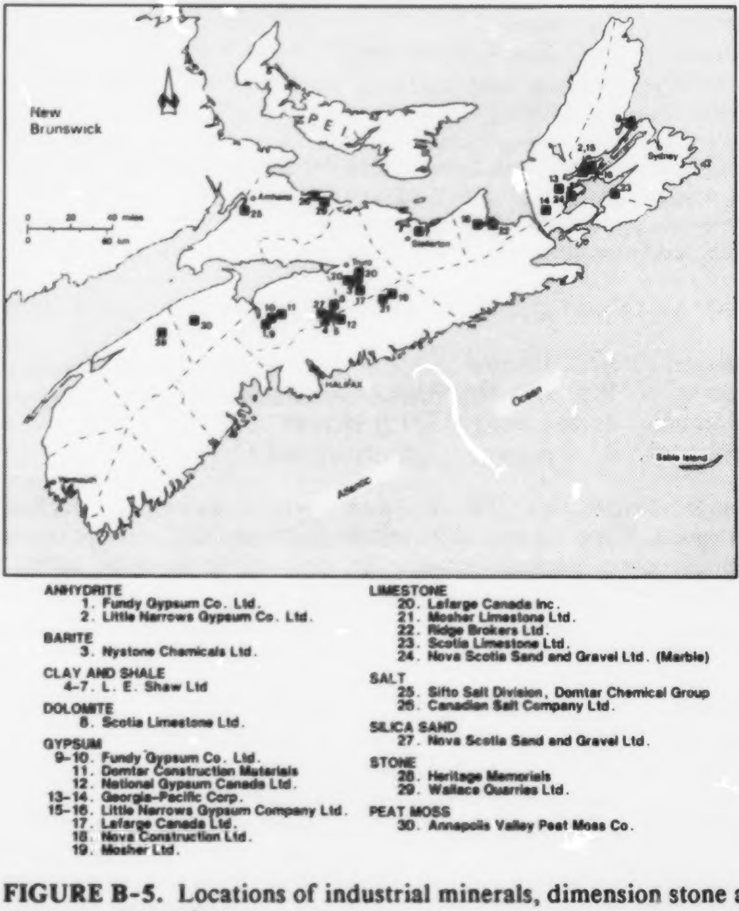

New Brunswick
P E I
Amherst
Stellarton
Truro
Sydney
Halifax
Yarmouth
Ocean
Atlantic
Sable Island
0 20 40 miles
0 60 km
ANHYDRITE
1. Fundy Gypsum Co. Ltd.
2. Little Narrows Gypsum Co. Ltd.
BARITE
3. Nystone Chemicals Ltd.
CLAY AND SHALE
4–7. L. E. Shaw Ltd
DOLOMITE
8. Scotia Limestone Ltd.
GYPSUM
9–10. Fundy Gypsum Co. Ltd.
11. Domtar Construction Materials
12. National Gypsum Canada Ltd.
13–14. Georgia-Pacific Corp.
15–16. Little Narrows Gypsum Company Ltd.
17. Lafarge Canada Ltd.
18. Nova Construction Ltd.
19. Mosher Ltd.
LIMESTONE
20. Lafarge Canada Inc.
21. Mosher Limestone Ltd.
22. Ridge Brokers Ltd.
23. Scotia Limestone Ltd.
24. Nova Scotia Sand and Gravel Ltd. (Marble)
SALT
25. Sifto Salt Division, Domtar Chemical Group
26. Canadian Salt Company Ltd.
SILICA SAND
27. Nova Scotia Sand and Gravel Ltd.
STONE
28. Heritage Memorials
29. Wallace Quarries Ltd.
PEAT MOSS
30. Annapolis Valley Peat Moss Co.

FIGURE B-5. Locations of industrial minerals, dimension stone and peat moss operations

The Province's numerous aggregate producers operating in both granular and bedrock deposits supply the provincial requirements while two companies, Construction Aggregate Limited and Permanent Concrete Ltd., supply aggregate to the export market.

Gypsum and Anhydrite

LAFARGE CANADA INC.
(Formerly Canada Cement Lafarge Ltd.)

Manager:	G. Langford
Address:	P. O. Box 5, Brookfield, N. S. B0N 1C0
Production:	Nil
Employees:	See under Limestone

This small quarry is located just east of Brookfield, Colchester County and operates only as a source of gypsum to meet the needs of the company's cement plant. The company's requirements for 1988 were purchased from other gypsum producers.

DOMTAR CONSTRUCTION MATERIALS LTD.

Manager:	S. G. Johnson
Address:	P. O. Box 758, Windsor, N. S. B0N 2T0
Production:	11,681 tons (10 597 t) gypsum
Employees:	3

Domtar Construction Materials Ltd. owns a quarry at MacKay Settlement, Hants County. The mining is carried out by a contractor under the supervision of Domtar. Domtar calcines the crude gypsum at a plant in Windsor, N. S.

FUNDY GYPSUM CO. LTD.

Manager:	G. Raymond
Address:	P. O. Box 400, Windsor, N. S. B0N 2T0
Production:	65,564 tons (59 480 t) anhydrite 1,675,836 tons (1 520 318 t) gypsum
Employees:	194

The Fundy Gypsum Co. Ltd. operates two quarries and crushing plants located in the Wentworth Creek and Miller Creek areas near Windsor, Hants County. After quarrying, the materials are crushed and transported via unit train to shiploading facilities at Hantsport for shipment to wallboard and cement plants in the United States.

The company produced gypsum from its Miller Creek quarry and both gypsum and anhydrite from the Wentworth Creek quarry. The gypsum and anhydrite are separated in the company's heavy media separation plant prior to shipment.

GEORGIA PACIFIC CORPORATION

Manager: J. Graham
Address: P. O. Box 400, Port Hawkesbury, N. S. B0E 2V0
Production: 1,032,577 tons (936 754 t) gypsum
Employees: 67

Georgia Pacific Corporation operates two gypsum quarries in Inverness County. The River Denys quarry continued operations with the product being transported by rail to shiploading facilities at Point Tupper. A new quarry commenced operations in 1987 near Sugar Camp Lake, approximately eight miles (10 k) southwest of the River Denys quarry. Gypsum producted from Sugar Camp Lake is transported by truck to dockside at Point Tupper.

LITTLE NARROWS GYPSUM COMPANY LTD.

Manager: T. H. Davis
Address: Little Narrows, N. S. B0E 1T0
Production: 76,153 tons (69 086 t) anhydrite
1,113,955 tons (1 010 583 t) gypsum
Employees: 108

Little Narrows Gypsum Company Ltd. operates two gypsum quarries and one anhydrite quarry near Little Narrows, Victoria County. All the gypsum and anhydrite produced is shipped from the Company's dock on St. Patrick's Channel in the Bras d'Or Lakes to destinations in Canada and the United States.

NATIONAL GYPSUM (CANADA) LTD.

Manager: P. Mills
Address: P. O. Box 637, Dartmouth, N. S. B2Y 3Y9
Production: 3,143,395 tons (2 851 688 t) gypsum
Employees: 116

National Gypsum operates the largest gypsum quarry in the province at East Milford, Halifax County. This quarry is the single largest gypsum quarry in the western world. The company transports the gypsum by unit train from Milford to Wright's Cove, Dartmouth where it is loaded on ships bound for points in Canada and the United States.

NOVA CONSTRUCTION LTD.

President:	John Chisholm
Address:	P. O. Box 1328, Antigonish, N. S. B2G 2L7
Production:	39,829 tons (36 133 t) gypsum
Employees:	4

The company has started production from a quarry at Brierly Brook, Antigonish County. Some of the output is sold to Canada Cement Lafarge Ltd. for use in cement and the remainder exported from the company's dock at Aulds Cove.

Salt

CANADIAN SALT COMPANY LTD.

Manager:	Wm. McCormick
Address:	P. O. Box 160, Pugwash, N. S. B0K 1L0
Production:	758,532 tons (688 136 t) salt
Employees:	189

The Canadian Salt Company mine is located in Pugwash, Cumberland County. A room and pillar system of extraction is employed utilizing trackless diesel and electric equipment. The processing plant onsite produces industrial grades of salt, blocks for farm use and refined salt for domestic consumption. The industrial grades are supplied in bulk for truck transportation, bagged for rail transportation or transported in bulk or bags to storage and shiploading facilities at the Pugwash Harbour wharf.

DOMTAR CHEMICALS GROUP, SIFTO SALT DIVISION

Manager:	J. Trebish
Address:	P. O. Box 550, Amherst, N. S. B4H 4A1
Production:	98,096 tons (88 992 t) salt
Employees:	91

Domtar Chemicals Group, Sifto Salt Division, operates a solution salt mine located near Nappan, Cumberland County. The mining procedure involves drilling a bore hole from surface into the underground salt deposit. Water is pumped down to the deposit, where it dissolves the salt, forming brine. The brine flows back to the surface where the salt is recovered from the brine using the "mechanical vapour recompression evaporating process" system.

Barite

NYSTONE CHEMICALS LTD.

Manager: V. Prostak
Address: P. O. Box 64, Debert, N. S. B0M 1G0
Production: 4,000 tons (3 629 t) ore mined
748 tons (824.5 t)
pharmaceutical quality barite
Employees: 16

The barite ore is mined and crushed by a contractor at the mine site northeast of Brookfield, Colchester County. The ore is then shipped to the company's plant at Debert where it is upgraded to a pharmaceutical quality product which is shipped to its parent company, E-Z-M Corporation, New York, USA for further processing and packaging.

Limestone and Dolomite

LAFARGE CANADA INC.
(Formerly Canada Cement Lafarge Ltd.)
Manager: G. Langford
Address: P. O. Box 5, Brookfield, N. S. B0N 1C0
Production: 596,199 tons (540 868 t) limestone
Employees: 14 (Quarry)
74 (Cement Plant)

Lafarge Canada Inc. operates a limestone quarry and cement manufacturing plant at Brookfield, Colchester County. The total production from the quarry is processed at the plant which is owned and operated by the company.

MOSHER LIMESTONE LTD.

Manager: R. Mosher
Address: P. O. Box 28, Upper Musquodoboit, N. S. B0N 2M0
Production: 96,406 tons (87 459 t) limestone
Employees: 24

Mosher Limestone operates two quarries near Upper Musquodoboit, Halifax County and one quarry near Cooks Brook, Halifax County.

The company produces agricultural grade dolomitic limestone in its grinding plant at Upper Musquodoboit. The product is bagged or supplied in bulk for wide distribution throughout the Atlantic Provinces as a soil conditioner.

RIDGE BROKERS LTD.

Manager:	A. Alward
Address:	P. O. Box 59, Havelock, N. B. E0A 1W0
Production:	14,000 tons (12 700 t) limestone
Employees:	6

The company operates a small limestone quarry at South Side, Antigonish Harbour, Antigonish County.

SCOTIA LIMESTONE LTD.

Manager:	J. D. Coffin
Address:	P.O. Box 457 Sydney, N. S. B1P 6H4
Production:	20,573 tons (18 664 t) limestone
Employees:	13

The company operates limestone quarries at Irish Cove, Cape Breton County and at Kellys Cove, near New Campbellton, Victoria County. The Kellys Cove quarry is operated by Mosher Limestone Ltd. to produce agricultural grade dolomite, aggregate and limestone for Sydney Steel and limestone for the mineral filler market. The Irish Cove quarry is operated periodically by a contractor to produce limestone for Sydney Steel.

Clay, Shale, Industrial Sand, Marble

L. E. SHAW LTD. (NOVA SCOTIA SAND AND GRAVEL)

President:	A. Shaw
Address:	5251 Duke Street, Halifax, N. S. B3J 1P3
Production:	39,700 tons (36 016 t) clay & shale 27,492 tons (24 941 t) industrial sand 6,780 tons (6 151 t) marble
Employees:	13

L. E. Shaw and its subsidiary company, Nova Scotia Sand and Gravel, operate seven properties in Nova Scotia. The clay and shale are quarried from pits at Lantz, Milford and Shubenacadie (all in Hants

County) and from a quarry in New Glasgow, Pictou County. The materials quarried are used in the company plant located in Lantz, Hants County, for the manufacture of bricks and tiles. The company also produces industrial sand at Elmsdale, Brazil Lake and Sandy Desert, and architectural limestone from a quarry at Marble Mountain, Inverness County.

AGGREGATE RESOURCES

Crushed stone and sand and gravel comprise the aggregate resources category.

Crushed Stone

The Province had 17 rock quarry operations in production that produced a total of 6,288,240 tons (5 700 000 t) in 1988 and employed 230 people. The value of crushed rock production is $28.5 million.

Sand and Gravel

There were 63 producers of sand and gravel operating in the province, employing 494 people. Total production, which includes production for the Nova Scotia Department of Transportation, was 9,920,700 tons (9 000 000 t). The value of sand and gravel production is $36 million.

MISCELLANEOUS MATERIALS PRODUCTION

The production of miscellaneous materials is shown in Table B-5. Locations are shown on Figure B-5.

Dimension Stone

HERITAGE MEMORIAL LTD.

Owner:	G. Nelson
Address:	P. O. Box 308, Windsor, N. S. B0N 2T0
Production:	430 tons (390 t) granite
Employees:	21

The company periodically operates a small quarry at Nictaux West, Annapolis County. The grey granite is used as dimension stone at the company's memorial manufacturing plant at Windsor, Hants County.

ARSENAULT MONUMENT WORKS LTD.

Owner: P. Arsenault
Address: P. O. Box 1475, Antigonish, N. S. B3B 2L4

Arsenault Monument Works Ltd. periodically operates a quarry at Lock Katrine, Antigonish County, for the production of dimension stone used in memorials. No production was recorded in 1988.

WALLACE QUARRIES LTD.

Owner: S. Flynn
Address: Wallace, Cumberland Co., N. S. B0K 1Y0
Production: 300 tons (272 t) building stone
Employees: 5

The Wallace Quarries reopened during the year to supply building stone for major building rehabilitation work in Halifax, Sydney and Ottawa.

Peat Moss

ANNAPOLIS VALLEY PEAT MOSS CO.

President: H. Endres
Address: Berwick, N. S. B0P 1E0
Production: 6,610 tons (5 997 t) peat moss
Employees: 40 (some part-time)

The company uses vacuum harvesters to recover peat from a 500 acre (200 ha) bog located near Berwick, Kings County.

TABLE B-1. Metallic Mineral Production for the calendar year 1988

COMPANY	LOCATION	PRODUCTION		TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] ($)
COPPER					
Rio Kemptville Tin Corp.	East Kemptville, Yarmouth County	976,057 (lbs.) (copper - in - concentrate)	442 732 kg	..[3]	1,387,100
GOLD					
Coxheath Gold Holdings Limited	Tangier, Halifax County	436 (troy ozs.)	13 561 g	93	234,600
Westminer Canada Limited	Forest Hills, Guysborough County Beaver Dam, Halifax County	6,867 (troy ozs.)	213 587 g	138	3,694,700
Other	Various	76 (troy ozs.)	2 364 g	1	40,800
	TOTAL (gold)	7,379 (troy ozs.)	229 512 g	232	3,970,100
SILVER					
Coxheath Gold Holdings Limited	Tangier, Halifax County	10 (troy ozs.)	311 g	..[3]	100
Rio Kemptville Tin Corp.	East Kemptville, Yarmouth County	16,791 (troy ozs.)	522 258 g	..[3]	139,800
Westminer Canada Limited	Forest Hills, Guysborough County	168 (troy ozs.)	5 225 g	..[3]	1,400
	TOTAL (silver)	16,969 (troy ozs.)	527 794 g	..[3]	141,300
TIN					
Rio Kemptville Tin Corp.	East Kemptville, Yarmouth County	8,283,632 (lbs.) (tin - in - concentrate)	3 757 382 kg	232	33,730,200
ZINC					
Rio Kemptville Tin Corp.	East Kemptville, Yarmouth County	270,533 (lb.) (zinc - in - concentrate)	122 714 kg	..[3]	202,900
	TOTAL FOR METALLIC MINERAL PRODUCTION			464	39,430,600

[1] total number of employees including office, clerical, supervisory, mining and production

[2] estimated value based on average annual metal price times volume

[3] included elsewhere

NOTE - production represents shipments; sum of components may not add due to rounding

TABLE B-2. Coal production for the calendar year 1988

COMPANY	MINE NAME	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[2] ($)
UNDERGROUND MINING						
Cape Breton Development Corp. (CBDC)	Prince Mine Phelan Mine Lingan Mine	Point Aconi, Cape Breton County Lingan, Cape Breton County Lingan, Cape Breton County	3,602,477	3 268 146	3,398	
Evans Coal Mines Ltd.		St. Rose, Inverness County	42,826	38 852	45	
		TOTAL (underground)	3,645,303	3 306 998	3,443	
OPEN PIT MINING						
T. Brogan & Sons Construction Ltd.		Point Aconi, Cape Breton County	15,465	14 030	12	
Pioneer Coal Limited		Westville, Pictou County Reserve Mines, Cape Breton County	108,810 113,343	98 712 102 824	32 35	
		TOTAL (open pit)	237,618	215 566	79	
RECLAMATION						
Gael Tech Inc./Guildcraft		Sydney Mines, Cape Breton County	40,788	37 004	30	
		TOTAL (reclamation)	40,788	37 004	30	
		TOTAL FOR ALL COAL PRODUCERS	3,923,712	3 559 568	3,552	213,449,000

[1] personnel employed in clerical, supervisory, etc. positions as well as mining personnel

[2] estimated from Nova Scotia Department of Mines and Energy sources

NOTE - production represents shipments; sum of components may not add due to rounding

TABLE B-3. Industrial minerals production for the calendar year 1988

COMPANY	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] ($)
GYPSUM					
Domtar Gypsum	Windsor, Hants County	12,876	11 681	3	
Fundy Gypsum Co. Ltd.	Miller Creek and Wentworth Road, Hants County	1,847,274	1 675 838	194	
Georgia-Pacific Corp.	River Denys & Sugar Camp, Inverness County	1,138,210	1 032 577	57	
Little Narrows Gypsum Co. Ltd.	Little Narrows, Victoria County	1,227,913	1 113 955	108	
National Gypsum (Canada) Ltd.	Milford, Halifax County	3,464,984	3 143 385	116	
Nova Construction Limited	Brierly Brook, Antigonish County	43,904	39 829	4	
	TOTAL (gypsum)	7,735,160	7 017 273	482	84,311,000
ANHYDRITE					
Fundy Gypsum Co. Ltd.	Wentworth Road, Hants County	72,271	65 564	see gypsum	
Little Narrows Gypsum Co. Ltd.	Little Narrows, Victoria County	83,943	76 153	see gypsum	
	TOTAL (anhydrite)	156,215	141 717		1,701,000
SALT					
Canadaian Salt Co. Ltd.	Pugwash, Cumberland County	836,130	758 532	189	
Sifto Salt Division Domtar Chemical Group	Nappan, Cumberland County	108,131	98 098	91	
	TOTAL (salt)	944,261	856 628	280	21,585,000[3]
LIMESTONE					
Lafarge Canada Inc.	Brookfield, Colchester County	657,180	596 189	14	
Mosher Limestone Co. Ltd.	Upper Musquodoboit, Halifax County	108,268	98 406	24	
Ridge Brokers Ltd.	Southside Harbour, Antigonish County	15,432	14 000	6	
Scotia Limestone Ltd.	Irish Cove, Cape Breton County	22,678	20 573	13	
	TOTAL (limestone)	801,568	727 178	57	1,641,000
DOLOMITE					
Scotia Limestone Ltd.	Kellys Cove, Victoria County TOTAL (dolomite)	34,171	31 000	13	286,300
BARITE					
Mystone Chemicals Ltd.	Brookfield,				

TABLE B-3. Industrial minerals production for the calendar year 1988 (continued)

	Colchester County	TOTAL (barite)	825	748	16	1,110,000[3]
CLAY						
L E Shaw Ltd	Lantz, Halifax County Shubenacadie, Halifax County		30,644	27 800	4	0[4]
SHALE						
L E Shaw Ltd	Milford, Hants County New Glasgow, Pictou County		13,117	11 900	see clay	0[4]
		TOTAL (clay and shale)	43,761	39 700	4	0[4]
SILICA SAND						
Nova Scotia Sand and Gravel (Division of L E Shaw Ltd)	Nine Mile River, Hants County	TOTAL (silica sand)	30,304	27 492	6	1,900,000[3]
		TOTAL FOR INDUSTRIAL MINERALS	9,746,246	8 841 736	868	122,500,000

[1] total employees: mining, production, clerical, supervisory, etc

[2] estimate from Nova Scotia Department of Mines and Energy sources

[3] processed or manufactured value

[4] value assigned to the higher manufactured valuation (bricks)

NOTE - production represents shipments, sum of components may not add due to rounding

TABLE B-4. Secondary Mineral Manufacturing for the calendar year 1988

COMPANY	LOCATION	PRODUCTION		TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[2] ($)
MANUFACTURED BRICKS					
L. E. Shaw Ltd.	Lantz, Halifax County	17,500,000 (bricks)		55	7,350,000
PLASTER PRODUCTS					
Domtar Gypsum	Windsor, Hants County	10,082 (tons)	9 146 (tonnes)	12	1,800,000
PORTLAND CEMENT					
Lafarge Canada Inc.	Brookfield, Colchester County	457,718 (tons)	415 239 (tonnes)	74	54,000,000
	TOTAL FOR SECONDARY MINERAL MANUFACTURING			141	63,150,000

[1] total number of employees including office, clerical, supervisory, mining and production

[2] estimate from Nova Scotia Department of Mines and Energy sources

NOTE - production represents shipments; sum of components may not add due to rounding

TABLE B-5. Dimension stone and peat moss production during the 1989 calendar year.

COMPANY	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] ($)
DIMENSION STONE					
Heritage Memorials Ltd	Quarry: Nictaux, Annapolis County Plant: Windsor, Hants County	474	430	21	57,200
Nova Scotia Sand and Gravel	Quarry: Marble Mountain, Inverness County	7,473	6 780	3	400,000
Wallace Quarries Ltd.	Quarry: Wallace, Cumberland County	331	300	5	99,600
	TOTAL (dimension stone)	8,278	7 510	29	556,800
PEAT MOSS					
Annapolis Valley Peat Moss Company	Berwick, Kings County TOTAL (peat moss)	7,286	6 610	40	1,103,600[3]
	TOTAL FOR MISCELLANEOUS COMMODITY PRODUCTION			69	1,660,400

[1] total number of employees including office, clerical, superivisory, mining and production
[2] estimate from Nova Scotia Department of Mines and Energy sources
[3] processed or manufactured value
NOTE - production represents shipments; sum of components may not add due to rounding

APPENDIX C

PRIVATE SECTOR EXPLORATION

Exploration Activity

Mineral exploration in the private sector during calendar 1988 was down moderately from 1987 with a significant decrease in activity during the second half of the year. A preliminary estimate of $35 million is predicted for the cost of exploration work conducted in the Province during the year for all minerals except petroleum. This is down from the $45 million spent in 1987 but is still $9 million higher than the previous record of $21 million set in 1986. Exploration for gold accounted for the majority of the work with the remainder focused on industrial minerals, base metals and coal.

Several factors accounted for the slowdown in activity during the second half of 1988. A large percentage of the exploration undertaken in Nova Scotia over the past three years has been carried out by junior companies with financing derived from flow-through share funding. The uncertainty over the future of flow-through financing along with the negative impact of the October, 1987 stock market decline and the recent weakness in the price of gold resulted in many companies experiencing difficulties in raising exploration funds. In addition, a number of exploration programs have also been completed as part of the normal exploration cycle with companies now focusing efforts on the better properties.

The number of general claims staked in 1988 decreased by 38% over the previous year to 29,049 (includes both exploration and development license claims). A small increase was recorded in the number of claims staked for salt, potash and coal in 1988. A total of 31,768 claims for all commodities were in effect at the end of 1988 represented by 1196 exploration, development, coal, salt and potash, tailings and special licenses.

Approximately 255 companies and individuals held exploration interests (licenses or options) in the Province in 1988 including 32 major, 41 junior and 37 private companies. In addition, several mining lease holders carried out exploration on their leases or on unclaimed ground where these commodities did not require licenses (e.g. limestone, gypsum).

Gold

Exploration for gold was concentrated primarily in the historic gold districts throughout southern mainland Nova Scotia where gold-bearing quartz veins occur in Cambro-Ordovician metasedimentary rocks of the Meguma Group. As in other parts of the country, efforts have been concentrated on re-evaluating the known occurrences, particularly in areas of significant past production, as well as grass-roots exploration in other areas. Exploration for gold was also carried out in the Cambrian and Hadrynian volcano-sedimentary rocks of the Cape Breton Highlands.

Highlights of the work completed during 1988 are centred on the advanced surface and underground exploration programs undertaken on several properties in Halifax and Guysborough Counties. These include the Caribou, Moose River, Mooseland, Tangier and Fifteen Mile Stream gold properties in Halifax County and the Cochrane Hill, Forest Hill, Goldenville and Upper Seal Harbour gold properties in Guysborough County.

Westminer Canada Limited (Seabright division) continued a detailed evaluation of the Forest Hill gold property during 1988. The company completed surface diamond-drilling and additional underground diamond-drilling and bulk sampling at the Teasdale Mine and began underground bulk testing on the Kennedy zone, 700 metres east of the mine site. Western Mining of Australia acquired the assets of Seabright Resources Incorporated including the Forest Hill property in a takeover at the beginning of 1988. The company also continued to evaluate the Beaver Dam gold property in Halifax County and completed additional underground diamond-drilling and bulk sample tests.

Seabright Explorations Incorporated continued work on the Caribou and Moose River gold properties during the year. Detailed geological mapping, trenching, surface and underground diamond-drilling and underground bulk sampling was carried out at Caribou to assist in the evaluation of potential ore reserves at the Holman Mine. Seabright dropped their option on the property late in the year. A development ramp was driven on the Moose River property, 2 kilometers west of the village of Moose River, to facilitate underground bulk sampling of drill-indicated ore reserves in the vicinity of the Dr. Sutherland shaft. Surface bulk sampling was also started in the vicinity of the Touquoy mine property in the immediate vicinity of the village to test a potential large tonnage, low grade ore zone outlined in recent drilling. Detailed geological mapping, ground geophysical surveys and a large-scale diamond-drilling program was also undertaken on the property.

Hecla Mining Canada Limited, in a joint venture agreement with Acadia Mineral Ventures Limited, began a detailed underground exploration program at Mooseland during 1988 to assess drill-indicated ore reserves outlined in 1987. The company plans to complete a 360 m (1,180 ft.) shaft to facilitate bulk sampling on both the west zone in the vicinity of the old workings and the newly discovered east zone.

Coxheath Gold Holdings Limited continued the second phase of a detailed exploration and development program on the Tangier gold property during the year consisting of additional underground diamond drilling and bulk sampling. The company also carried out additional surface diamond-drilling to test the lateral strike extension of the zone currently under development.

Onitap Resources Incorporated and joint venture partner Orex Exploration Incorporated continued a detailed exploration program on the Upper Seal Harbour gold property near Goldboro. Surface drilling was continued on the property and an underground bulk sampling program was started mid-year to test drill-indicated ore reserves below the old workings. The Boston-Richardson shaft was rehabilitated to access the old workings and a 610 m (2000 ft.) decline was collared 250 m west of the shaft to facilitate the bulk sampling program.

Northumberland Mines Limited completed an underground bulk sampling and diamond-drilling program on the Cochrane Hill gold property during the first half of 1988. A decline was driven 100m east of the Mitchell shaft to access drill-indicated ore beneath the open pit. The company also completed detailed underground mapping and panel sampling on the Goldenville gold property during the year. NovaGold Resources Incorporated acquired both the Cochrane Hill gold property and the Goldenville gold property in a takeover of Northumberland Mines Limited in mid 1988. Operations on the two properties were continued by NovaGold until late in the fall when work was terminated.

Acadia Mineral Ventures Limited completed soil geochemical sampling, ground geophysical surveys and diamond-drilling on the Wine Harbour and Cochrane Hill (East) gold properties in Guysborough County, the Gold Lake and Oldham gold properties in Halifax County and on their Fanning Lake, Kemptville-Ogden and Parr Lake properties in Yarmouth County. Greenstrike Gold

Corporation continued a large-scale diamond-drilling program on the Fifteen Mile Stream gold property in Halifax County and NovaGold Resources Incorporated continued a detailed surface exploration program including diamond-drilling and surface bulk sampling on an adjoining the property at Fifteen Mile Stream. NovaGold also carried out diamond-drilling on the Miller Lake gold property in Guysborough County and the Lake Charlotte gold property in Halifax County.

Seabright Explorations Incorporated carried out ground geophysical surveys, trenching and diamond-drilling on the Salmon River and Lake Catcha gold properties in Halifax County and at Miller Lake in Guysborough County. The company also carried out soil geochemical sampling, ground geophysical surveys and diamond-drilling on their Cape Lake and Meadow Lake properties in Halifax County and at West Caledonia in Queens County. Scotia Prime Resources Limited completed additional drilling on the Lower Seal Harbour gold property in Guysborough County and completed soil geochemical sampling, ground geophysical surveys and diamond-drilling on their Cameron Dam and Otter Lake properties in Halifax County. Jascan Resources Incorporated completed diamond-drilling and trenching on the Salmon River (Dufferin Mines) gold property in Halifax County and Ressources Orleans Incorporated carried out geological mapping and diamond drilling on the east extension (Strawberry Hill) of the Tangier gold property.

Cobequid Resources Limited completed diamond-drilling and down-hole geophysics on the Highland gold property at Country Harbour gold in Guysborough County and carried out airborne and ground geophysical surveys and diamond drilling at McLeod Lake along the west strike extension of the Caribou gold property. Falconbridge Limited completed additional drilling on the Brookfield gold property in Queens County and Aurtec Mining Development Limited carried out a diamond-drilling program on the Cranberry Head gold property in Yarmouth County.

Scominex, under Inco Gold Management Incorporated management, continued a detailed follow-up program consisting of geological mapping, soil geochemical sampling, ground geophysical surveys and trenching in the MacMillan Flowage area approximately 25 km east of Cheticamp in the Cape Breton Highlands. In other areas of the Cape Breton Highlands, Noranda Exploration Company Limited carried out soil geochemical sampling, ground geophysical surveys and diamond-drilling on a property near Campbells Brook, approximately 12 km southeast of Cheticamp and completed additional follow-up work consisting of soil geochemical sampling, ground geophysical surveys and trenching on a property immediately north of Whycocomagh.

Base Metals

Exploration for base metals has shown a moderate increase in activity over the past year with several programs undertaken throughout the Province. The renewed interest in base metal exploration is due primarily to the current price levels for the primary metals which have increased significantly since the beginning of 1987. In addition, the current depletion of base metal ore reserves is providing additional incentive for exploration companies to focus on base metals. Several known base metal occurrences are currently being re-evaluated with particular emphasis on carbonate-hosted environments in the Lower Mississippian Windsor Group and Hadrynian rocks of the George River Group.

Dynamic Consolidated Resources Limited carried out a diamond-drilling program on the former barite/base metal producer at Walton, Hants County and Deak International Resources Limited (formerly Wilco Mining Company Limited) completed additional diamond-drilling on the former base metal producer at Stirling, Richmond County. United Reef Petroleums Limited carried out detailed geological mapping, soil geochemical sampling, ground geophysical surveys, stripping and trenching and underground mapping and lithological sampling on the Meat Cove zinc property near Meat Cove, Inverness County. Westminer Canada Limited began a detailed evaluation of the former lead\zinc producer at Gays River, Hants County.

Seabright Explorations Incorporated conducted geological mapping and diamond-drilling on a new discovery near Sugar Camp, Inverness County and Scotia Prime Resources Limited carried out preliminary work on a property in the vicinity of LeBlanc Lake, Inverness County. Tusk Minerals Limited carried out a small drilling program on a known copper showing near French Road, Cape Breton County and Granges Exploration Limited completed a small diamond-drilling program near Solomon Lake, Yarmouth County.

Industrial Minerals

Exploration for industrial minerals has shown a moderate increase in activity in recent years as interest continues to grow in the industrial mineral sector. Exploration for limestone and gypsum accounted for the majority of exploration activity for these commodities in 1988 and was directed primarily towards developing additional reserves on currently producing properties as well as developing new reserves in other areas.

Work carried out in 1988 included the exploration and development of several limestone properties in the Maitland area, Hants County by Lafarge Canada Incorporated and the development of new gypsum reserves in the Sugar Camp area, Inverness County by Georgia Pacific Corporation. Domtar Limited carried out exploration drilling for salt at Nappan, Cumberland County and also completed diamond-drilling for silica sand at McKay Settlement, Hants County. Kelrock Limited carried out bulk sampling for limestone at Glendale, Inverness County and at Glen Morrison, Cape Breton County and Lodestone Limited completed a bulk sampling program for magnetite near Bass River, Colchester County.

Coal

Exploration for coal during 1988 was undertaken by the Cape Breton Development Corporation (Devco) at the Phelan, Lingan and Prince collieries near Sydney, Cape Breton County. An ongoing program of advance exploration tunnelling at the Prince colliery and bore hole drilling at the Lingan and Phalen collieries was undertaken during the year to test coal reserves. Aquagold Resources Limited carried out an exploration drilling program for coal on Pictou Island along the Northumberland Strait.

Mining Development

Gold

Development work was continued by Westminer Canada Limited on the Forest Hill gold property in Guysborough County during the year. The company completed a 230 metre exploration shaft on the property in 1986 and began a program of underground drilling and bulk sample tests on a number of auriferous leads outlined from surface drilling. The work was continued in 1988 and included additional underground diamond-drilling and bulk sampling as well as extensive lateral development work to access drill-indicated ore.

Coxheath Gold Holdings Limited also continued development work on the Tangier gold property in Halifax County during the year. The company started the construction of a decline in 1987 and began a program of underground drilling and bulk sampling to test several auriferous leads outlined from surface drilling. The work was continued in 1988 and included additional underground diamond-drilling and bulk sampling. Test procedures for mining the narrow vein style of mineralization were also undertaken and the company completed the construction of a mill to process bulk sample material from the underground program and to handle future mine production. The company received a mining lease for the property in December with plans to begin commercial production at a rate of 250 tpd during the first quarter of 1989.

Industrial Minerals

Development drilling to expand on current gypsum reserves was continued by National Gypsum (Canada) Limited at East Milford, Hants County, by Fundy Gypsum Company Limited at Dutch Settlement, Hants County and by Little Narrows Gypsum Company Limited at Little Narrows, Victoria County.

Coal

A production decision was made by Westray Coal Incorporated to begin construction of a new underground thermal coal mine at Plymouth, Pictou County. The company plans to produce 1 million tonnes of low-sulfur bituminous coal annually by 1991 to supply expanded coal-fired electric generating facilities at Trenton, Pictou County.